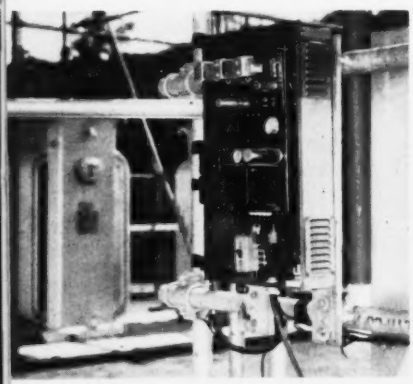
ELECTRICAL WEST

July 1953
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S.



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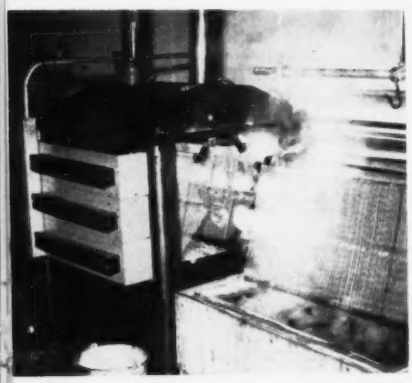

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Lots more leisure...
a built-in feature
with your all-electric kitchen
That's the big bonus that comes with an electric kitchen—leisure time. And whether you're entertaining with an elaborate "company" dinner or just feeding your favorite gang—the family—it's no job when you do it electrically.
You can spend most of the day in the garden, go shopping or visiting, and your dinner always will be ready right on time—done to the peak of perfection. Accurate, automatic electric controls take complete charge of the cooking, even in your absence.
Then add up these advantages: No cooking failures, far less after-mealtime scrubbing, and sparkling clean kitchen walls, ceiling and curtains. They mean still more leisure time, with electric cooking. You can depend on it.
Edison
SOUTHERN CALIFORNIA EDISON COMPANY
bought!
California living is better
ELECTRICALLY
What's the secret of that relaxed and easy going way of life known the world over as "California living"? We don't mind telling you. Our climate is part of it—and so is electricity.
"Electric" is one of the key words to comfort, convenience and pleasure in California homes. Replacing human energy in kitchens and laundries, electricity gets housework done faster and more easily, leaves extra time for rest and recreation.
The secret is that we Californians began adding enjoyment to our everyday lives just as soon as we discovered that "electric living" and "leisure living" were one and the same thing.
Edison
SOUTHERN CALIFORNIA EDISON COMPANY

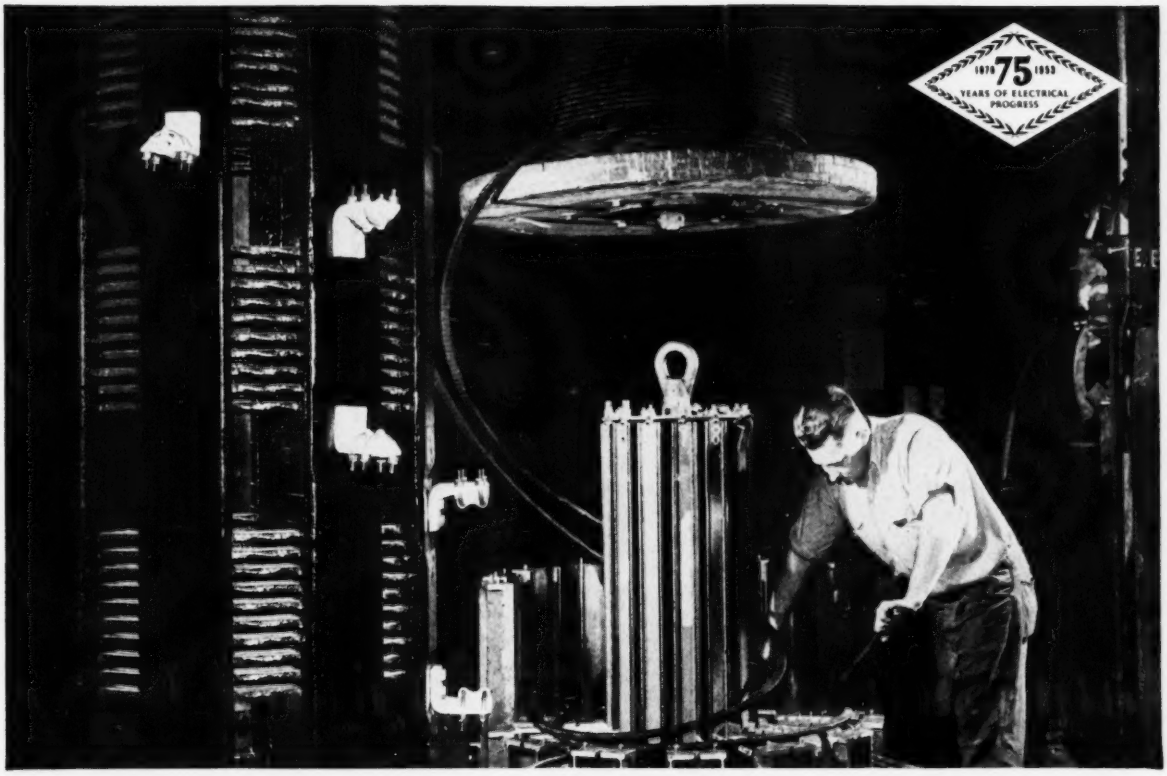
As an appliance dealer, did you ever think of what you're selling as "better living" rather than as "electrical appliances"? It's more than an interesting concept — it's a basic fact.

You are in the business of selling electrical appliances at a profit to yourself, of course. But your customers aren't in the market to buy appliances at a profit to you. What they want to buy is better living, at a profit to themselves in comfort, convenience and pleasure. When you sell an automatic washer, someone has bought easier washdays. And an electric range sold means better cooking for the buyer.

The point is that ***every*** appliance sale is really a combination of ***buying*** and ***selling.***

In Central and Southern California, we have been helping dealers to sell and customers to buy for over half a century—with both sides of the counter profiting. ***Edison tells them and the dealer sells them!***

SOUTHERN CALIFORNIA EDISON COMPANY



Save 10% on new G-E reactors with aluminum conductors

Same long life, same low maintenance, same high short-circuit strength . . . at 10% less cost

Now you can save 10% by buying General Electric cast-in-concrete reactors with *aluminum conductors.* These new G-E aluminum reactors will give you the same dependable performance—the same high degree of protection—as G-E units built with copper . . . at 10% less cost. There has been no sacrifice in the reactor quality that has been the favorite of industry for more than 35 years.

The "extra service" features of G-E reactors—both aluminum and copper types—that provide practically unlimited life and make maintenance a minor factor, include:

Non-aging glass insulation which assures greater protection against turn-to-turn short circuits than any other type of wound insulation used in reactor manufacture . . . withstands extremely high temperatures . . . remains unaffected by moisture and will not deteriorate even under high overloads.

Continually transposed conductors assure more uniform current-distribution . . . reduce losses, and increase short-circuit strength.

Wet steam curing assures full strength of concrete at shipment—no dangerous waiting period which occurs if concrete must cure after reactor is placed in service.

Other features include: good clearances; crossovers made within concrete supports; smooth, flameproof black japan finish and silver-plated terminals.

Metal housings, with provisions for cable entrance and exit can also be provided that will match the appearance of G-E switchgear. These housings minimize stray currents and electrical losses, protect reactors against damage, and increase safety for personnel.

You can buy these sturdy, dependable G-E cast-in-concrete reactors with either aluminum or copper conductors. For full information contact your nearest G-E Sales Office or write General Electric Company, Section 422-5, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

JULY
1953

SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S.
The all-industry magazine of progress, established 1887, and incorporating the "Electrical Journal," "Journal of Electricity, Power and Gas" and "Journal of Electricity." Contents copyright. Sixty-sixth year of publication

VOL. 111
NO. 1

ELECTRICAL WEST

George C. Tenney, Editor
W. A. Cyr, Associate Editor — Walter C. Heston, Engineering Editor
Peggy Boyer, Associate Editor — John Cootz, Typography

Next Month

Leading article contents for the July issue had to be changed on short notice and the Etiwanda steam plant story had to be held over until August. However, this made possible later pictures and permitted increased detail in the article. The plant has television monitoring and a number of very interesting design features that contributed to low unit cost.

We hope to have an August feature on a new all-glass-front downtown substation that is attracting much attention in Vancouver, B. C.

The cause of the wreck of an impulse water wheel at Bucks Creek power house and the moral to the story as the plant goes back into operation will be interesting information to all those interested in hydro. Metal fatigue resulting from bucket pins that were too tight was cause of the trouble.

Contractors will be interested in how a large chain store handled its distribution system, using 480 v and unit substations. How a contractor in Colorada Springs uses his own store to demonstrate low-voltage control and other wiring methods will be told.

In sales there will be a piece on a training program set up in Denver to school men in servicing automatic washers, dryers and dishwashers.

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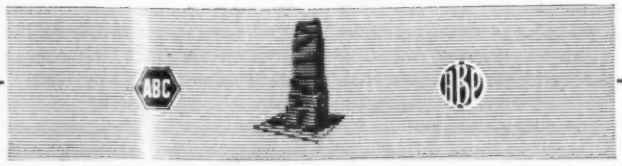

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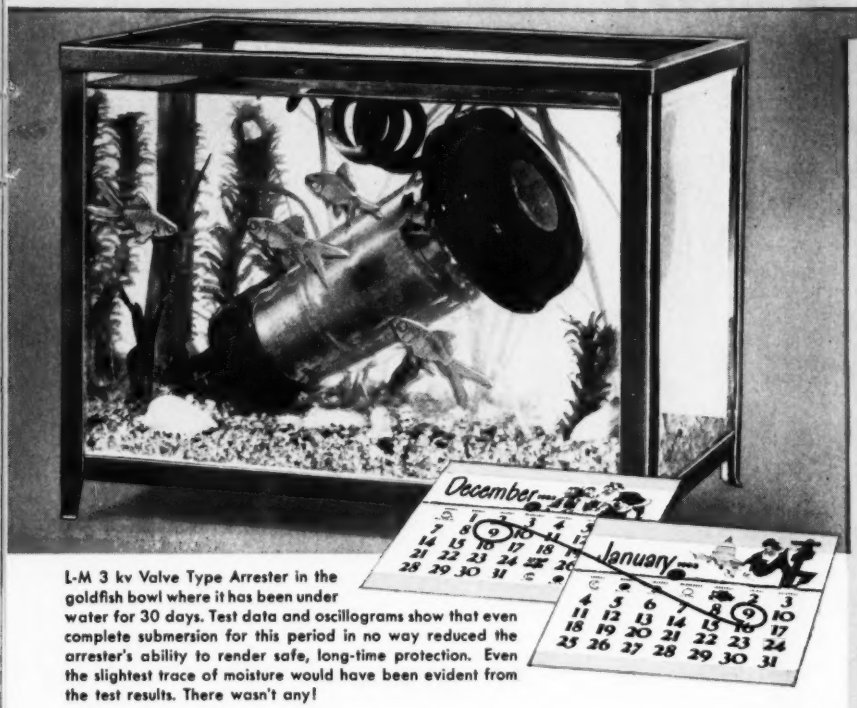
Here's L-M's Valve Type Arrester In With The Fish For 30 Days... But Tests Show It Stays Dry Inside



L-M 3 kv Valve Type Arrester in the goldfish bowl where it has been under water for 30 days. Test data and oscillograms show that even complete submersion for this period in no way reduced the arrester's ability to render safe, long-time protection. Even the slightest trace of moisture would have been evident from the test results. There wasn't any!

By **R. D. CLEAVES**
Manager, Protective and Switching Equipment Sales
Line Material Company

Started originally as something of a "gag," our goldfish bowl test demonstrates clearly the complete moisture-sealing of L-M valve type lightning arresters.

In a spirit of good clean fun, we tested a stock L-M arrester and put it into a big goldfish bowl as a sales conference stunt—just to show L-M Field Engineers that goldfish couldn't get inside of it. But we left the arrester, completely submerged in the tank of water, for 30 days. Then we repeated the same tests made originally on the arrester.

At the end of the 30-day period, the lightning arrester was in good operating condition. It had the same characteristics as it had originally, as shown by our laboratory's test data and oscillograms at the right. There was absolutely no moisture leakage.

You'll probably never try to operate an L-M valve type arrester under water. But you can be sure that prolonged rain or humid air will never affect its operating characteristics. For L-M arresters are completely and permanently sealed against moisture, and retain their operating characteristics without change for many, many years.

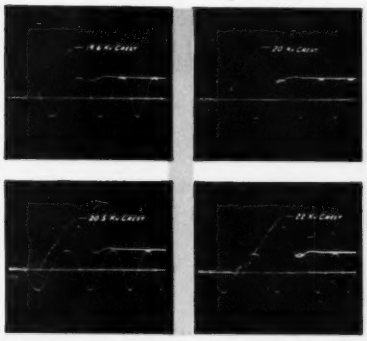
Get the Whole Story on L-M Valve Type Arresters

L-M arresters have many features that contribute to their ability to protect other apparatus without fault. The precision gap is heavily built, with electrodes machined out of solid brass bars. The valve element is molded directly into the housing, filling it completely and solidly. Lens-shaped electrodes distribute surges evenly through the element, resulting in maximum surge capacity. The Isolator, an L-M-patented insurance feature, guarantees that no matter what happens, the arrester will never ground feeders.

Get the whole story. Ask the L-M Field Engineer for Bulletin LA-2. Or write direct to Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

BEFORE **AFTER**

1. Front of Wave Sparkover



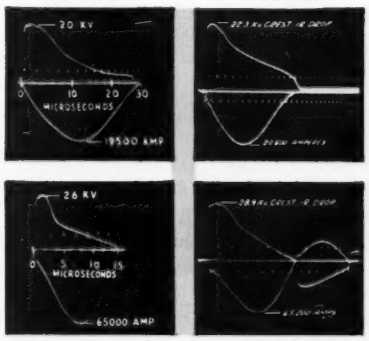
Oscillograms of two impulse sparkover tests before (left) and after (right) show no change in the protection offered by the arrester after 30 days in the goldfish bowl.

2. 60 Cycle Sparkover and Radio Noise

Both before and after the 30-day test, the arrester was noise-free through the sparkover voltage of 7 kv rms.

3. IR Drop

BEFORE **AFTER**



On both 20,000 and 65,000 ampere surges, the arrester showed no change in IR Drop from the surge tests made before the demonstration.

4. Discharge Current Withstand

After the demonstration, the arrester was given five shots of 65,000 amperes each. These caused no damage.

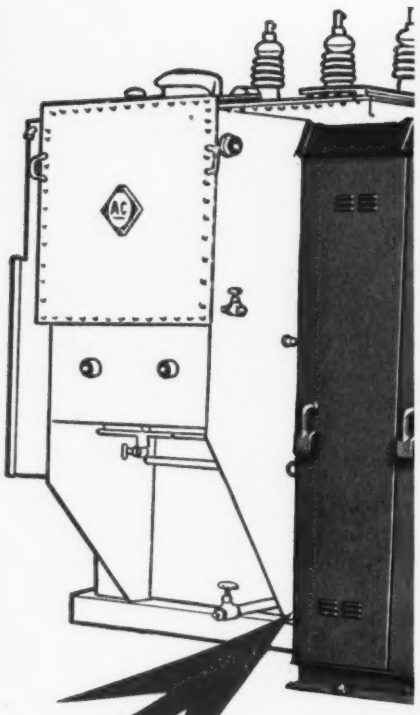
LM®

LINE MATERIAL
Lightning Arresters

MULTI-CIRCUIT

Unit Substations

Are Easy to Double-End



Now You Can Install A-C Unit Substations That Are Planned for Easy Future Double-Ending Without Service Interruption!

WHEN LOAD GROWTH demands additional power, or when you want the added reliability of two transformers, the Allis-Chalmers Unit Substations you install today will be easy to double-end.

Your line crew will find all mechanical and electrical connections easy to make . . . the transformer throat and switchgear bus easy to align. That's because sufficient mechanical flexibility is built into the throat to permit realistic tolerances in concrete base construction.

Design Aids Quick Field Assembly

Pre-drilled bus extensions are accessible and flexible enough to be consistent with throat construction. There are no compound-filled joints requiring melting, chipping, cracking, or scraping. Just apply no-corona tape and insulating tape to finish the job.

Double-ending is easy also in terms of system operation. When planned from the initial installation, double-ending can be accomplished with no interruption in power service to your customers. Even on substations not planned initially for double-ending, the job can be done with minimum outage.

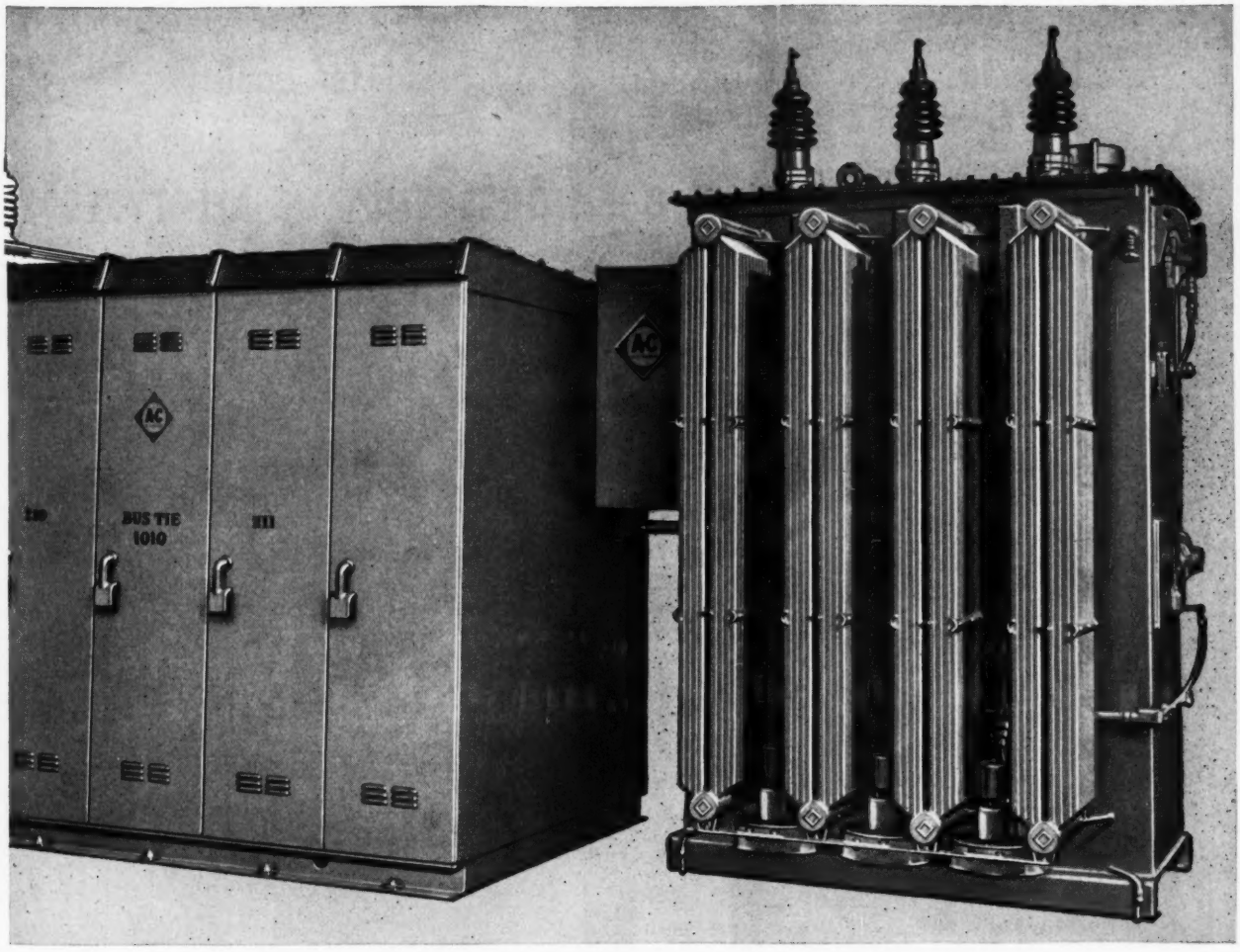
Because Allis-Chalmers Unit Substations are designed to grow with your system, they are a convenient answer to the growing distribution problem . . . to the ever-increasing demand for power and yet more power. They are simple to specify, neat and modern in appearance, and easy to expand.

You Save These Five Ways:

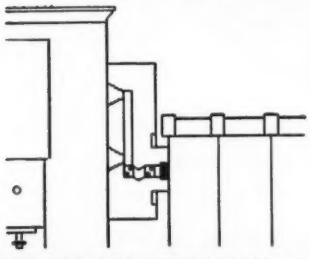
(1) Original equipment cost is low; (2) compact construction reduces space requirements and real estate costs; (3) pre-wired unit design speeds installation; (4) maintenance is quick and economical because of improved accessibility; and (5) you purchase only the equipment you need *now*, deferring additional expenses until load growth demands the expenditure.

For the full story on what Allis-Chalmers Unit Substations can mean in your distribution system, call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3729

ALLIS-

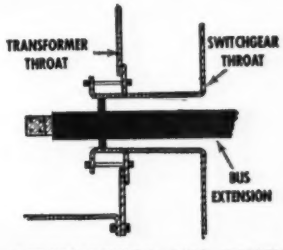


Here's Why It's Easy to Double-End MCS's



1 THE THROAT OPENINGS of all substation transformers, regardless of rating, are the same height as switchgear throat opening. This standardized throat location permits easy addition of a new transformer to the switchgear end of an installed Allis-Chalmers Unit Substation . . . simplifies and speeds field assembly.

2 FEEDER UNITS are jig built so that each feeder cubicle is exactly like every other one. Bus extension openings, control wiring openings . . . even small screw holes . . . are pre-cut in jigs. This careful, uniform construction makes addition of a main breaker easy . . . assures easy alignment of the new transformer.



3 MECHANICAL AND ELECTRICAL connections are easy to make. Bus connectors and transformer throat are flexible enough to compensate for minor irregularities in concrete surfaces. Silver-plated, pre-drilled bus extensions are easy to bolt together. No-corona tape and insulating tape finish the joint.

CHALMERS

A-C ALLIS-CHALMERS

N
look to.....
E

SMOOT-HOLMAN

W
.....for quality
S

INDUSTRIAL INCANDESCENT & FLUORESCENTS OF ALL TYPES

MERCURY/INCANDESCENT ASSEMBLY

This twin reflector unit is highly efficient, used with two 400 watt mercury vapor lamps or with one 400 watt mercury and one 750 watt incandescent it provides efficient correct color illumination. It may also be used for two incandescent

NE-2661

The Smoot-Holman standard for industrial illumination is the ever-popular open-end fluorescent. This highly efficient, adaptable porcelain enameled reflector will not be damaged by abrasive dust or oily vapor and naturally carries the RLM label.

MASTER

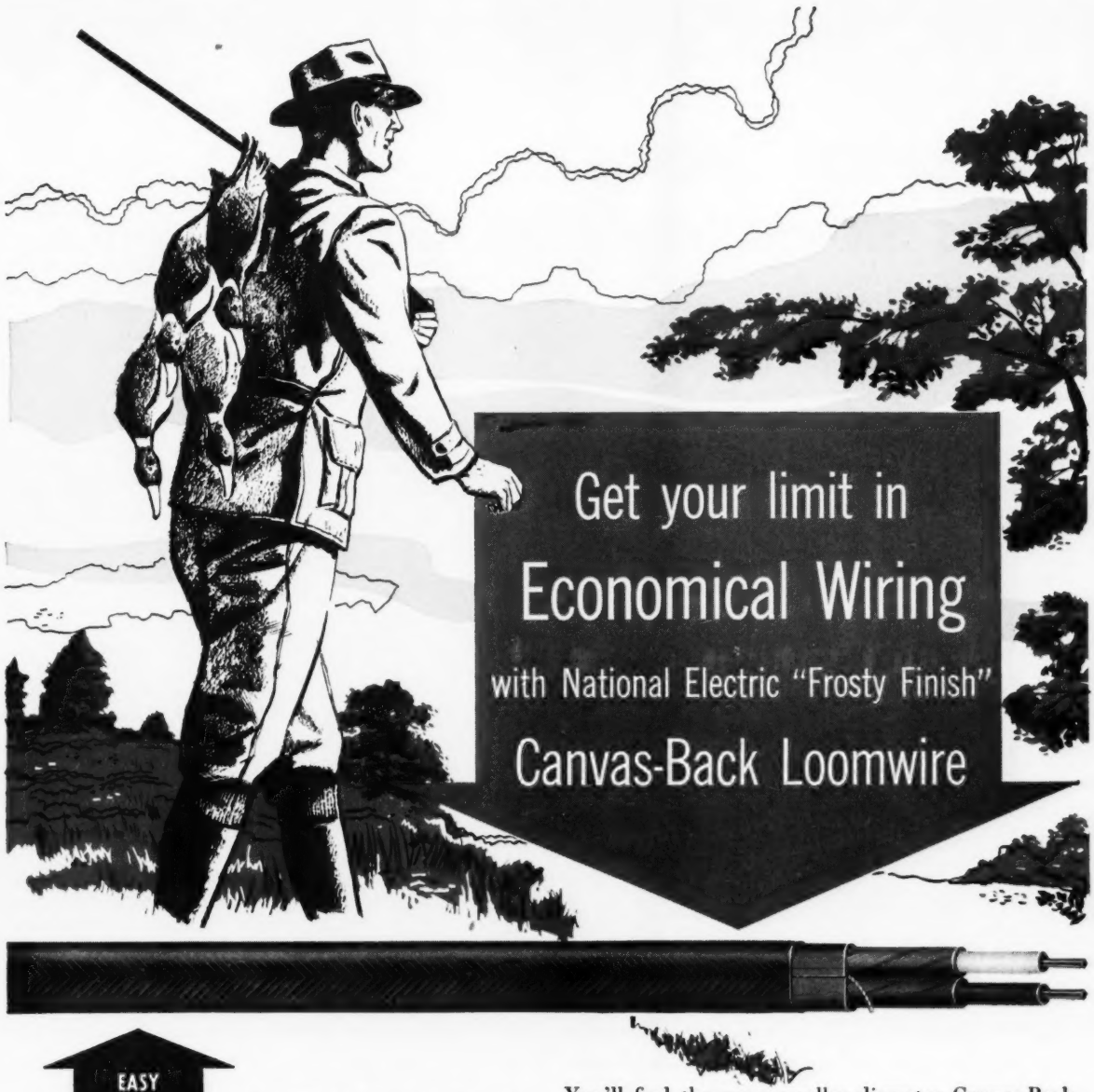
The SMOOT-HOLMAN MASTER is the ideal flood for all outdoor installations such as service stations, used car lots, parking lots, etc. High efficiency — low maintenance with uniform light distribution over the desired area. Available with "kicker" for accent lighting. Lamp sizes 750/1000/1500 watts.

STANDARD DOME

The Smoot-Holman Standard Dome is a sturdy one-piece reflector finished with highest quality porcelain enamel. [illegible] cutoff gives excellent shielding and proper light distribution. Easy maintenance—long life. Carries RLM label. Lamp sizes [illegible] 1000/1500 watt.

ILLUMINATION EQUIPMENT, INGLEWOOD, CALIFORNIA

BRANCH OFFICE AND WAREHOUSE SAN FRANCISCO



Get your limit in Economical Wiring

with National Electric "Frosty Finish" Canvas-Back Loomwire

EASY STRIPPING

Canvas-Back's paper dam around the conductor assembly prevents penetration of the saturant . . . assures free, easy stripping and clean conductors.

NO HOT WEATHER TACKINESS

Canvas-Back pulls easily—even at high temperatures—doesn't stick to your hands.

You'll find the new, smaller diameter Canvas-Back Loomwire is the most economical non-metallic sheathed cable available for use in all your normal requirements. Available with Type TW or Type R conductor insulation, National Electric "Frosty Finish" Canvas-Back Loomwire gives you both flame and moisture resistance.

NE "Frosty Finish" Canvas-Back Loomwire is sold through leading distributors everywhere and listed by Underwriters' Laboratories, Inc. EVERYTHING IN WIRING POINTS TO

National Electric Products

PITTSBURGH, PA.

3 PLANTS • 7 WAREHOUSES • 34 SALES OFFICES

Cross-country "jogging" proves this transformer can *take it!*

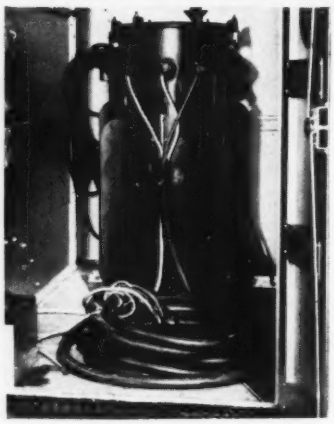
Brockton-Edison's trailer-mounted "CSP®" Transformer gets more jolts and bumps in one day of cross-country service than the average transformer receives in a lifetime. Yet this "CSP" Transformer has performed perfectly every time it has been used to maintain service during emergency or routine transformer change-outs.

Brockton-Edison used "Westinghouse" for their ingenious trailer rig, because they needed an extra-tough transformer for such rugged service. They chose a "CSP" Transformer because its built-in breaker eliminates the necessity for any separately mounted protective devices. All they have to do is make the connection and use the "CSP" Breaker to pick up or disconnect the load.

"CSP" Transformers can take it, whether mounted on a pole or in a trailer, even under the most adverse conditions. Why not prove to yourself that Westinghouse "CSP" Transformers can cut distribution, installation and maintenance costs. Ask your Westinghouse representative for a copy of B-4247-B, *Transformer Costs . . . and their relation to Profits.* Or write to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70662-A

Even after miles of hauling over bumpy, rural roads, this rugged "CSP" Transformer gives dependable service. Only normal external transformer connections need be made. The "CSP" Breaker is used to pick up the load.



This 37.5-kva "CSP" Transformer fits compactly into Brockton-Edison's movable trailer because its built-in protection eliminates the need for separate protective devices and excess wiring. This ingenious arrangement simplifies change-outs, with fast service any time . . . anywhere.

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver

Partial Assemblies Courtesy of Hermetic Seal Products Co.

Now 4 D-H Special Alloys Cover Most Glass-to-Metal Sealing Needs

From a single source, the Driver-Harris Company, you can now obtain metal alloys to meet your glass-to-metal sealing needs for both *hard* and *soft* glass.

NEW ALLOY THERLO* This cobalt, nickel iron alloy, possesses ideal properties for sealing hard or thermal shock resistant glass. It matches such commercial hard glasses as Corning 7052 and 7040 in expansivity from 80°C to the annealing point. It produces a permanent vacuum-tight seal with simple oxidation procedure and resists attack by mercury. Readily machined and fabricated, it can be welded, soldered or brazed.

DRIVER-HARRIS 142 ALLOY contains 42% nickel. This is the standard alloy for sealing into sealed beam auto lamps using Corning 776 glass. Used with a borated copper coating, it is the accepted seal for incandescent lamps and radio tubes and matches 8160 glass.

DRIVER-HARRIS 52 ALLOY contains 50% nickel. It provides a slightly higher coefficient of expansion than the D-H 142 alloy and seals successfully with 0120 glass.

DRIVER-HARRIS 146 ALLOY contains 46% nickel. It offers special expansion properties, which permit seals with ceramic coated materials as shown above.

Manufactured to the same high standards that have made Driver-Harris the leader in special purpose alloys for more than 40 years, these alloys are available as rod, wire, strip, sheet foil—and in special shapes. They enable you to meet your specific sealing needs from a single source—so why not consult us today.

*T.M. Reg. U. S. Pat. Off.

Also sole producers of Nichrome, Advance* and Karma**

Driver-Harris Company

Western Representative: **ANGUS-CAMPBELL, INC.**

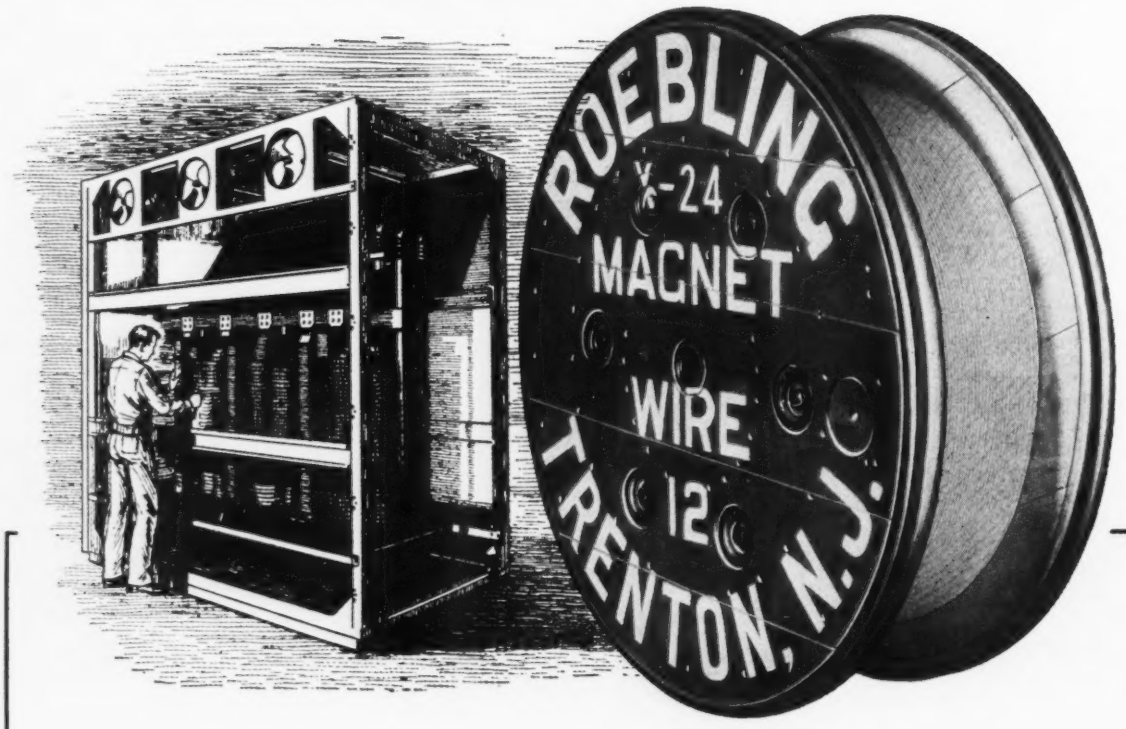
5320 Santa Fe Ave., Los Angeles 58 917 Bryant St., San Francisco 3

Main Office and Plant: HARRISON, NEW JERSEY

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

Now...a new high temperature magnet wire...

ROEBLING ROETEMP



ROETEMP MAGNET WIRE brings you a brand new and superior type of insulation for applications that involve high operating temperatures. Its heat-resistant properties and dielectric strength, its extra toughness and working ease make this new Roebling ROETEMP your top choice for Class B, dry-type transformer windings, and for other electro-magnetic devices designed for operation with hot spot temperatures of 130°C (266°F).

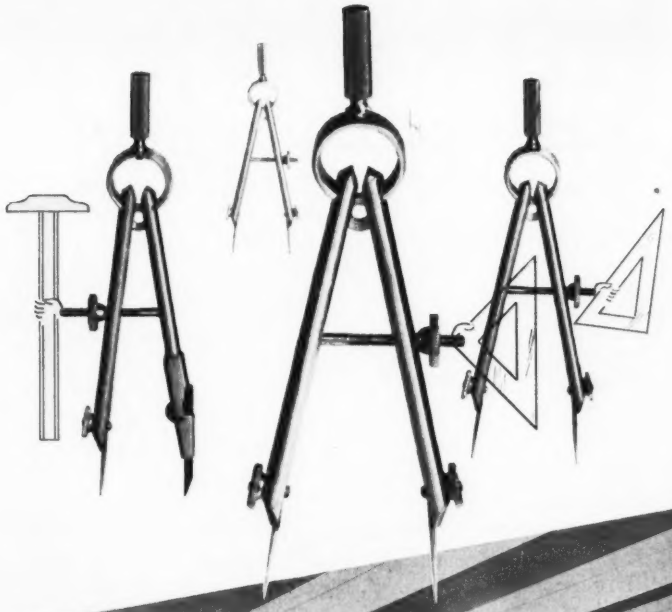
Roebling ROETEMP Magnet Wire is insulated with a specially processed tape applied in a single wrap with a liberal overlap. It is exceptionally pliable and bends without cracking or separating from the conductor. It won't unravel; is ideal for higher speed winding; comes in a range of sizes from #1 to #12 AWG, round, square and rectangular.

Write for full data on Roebling ROETEMP Magnet Wire...and Roebling silicone bonded ROEGLAS wires for special temperature problems. John A. Roebling's Sons Corp., Trenton 2, N. J.

A subsidiary of The Colorado Fuel and Iron Corporation

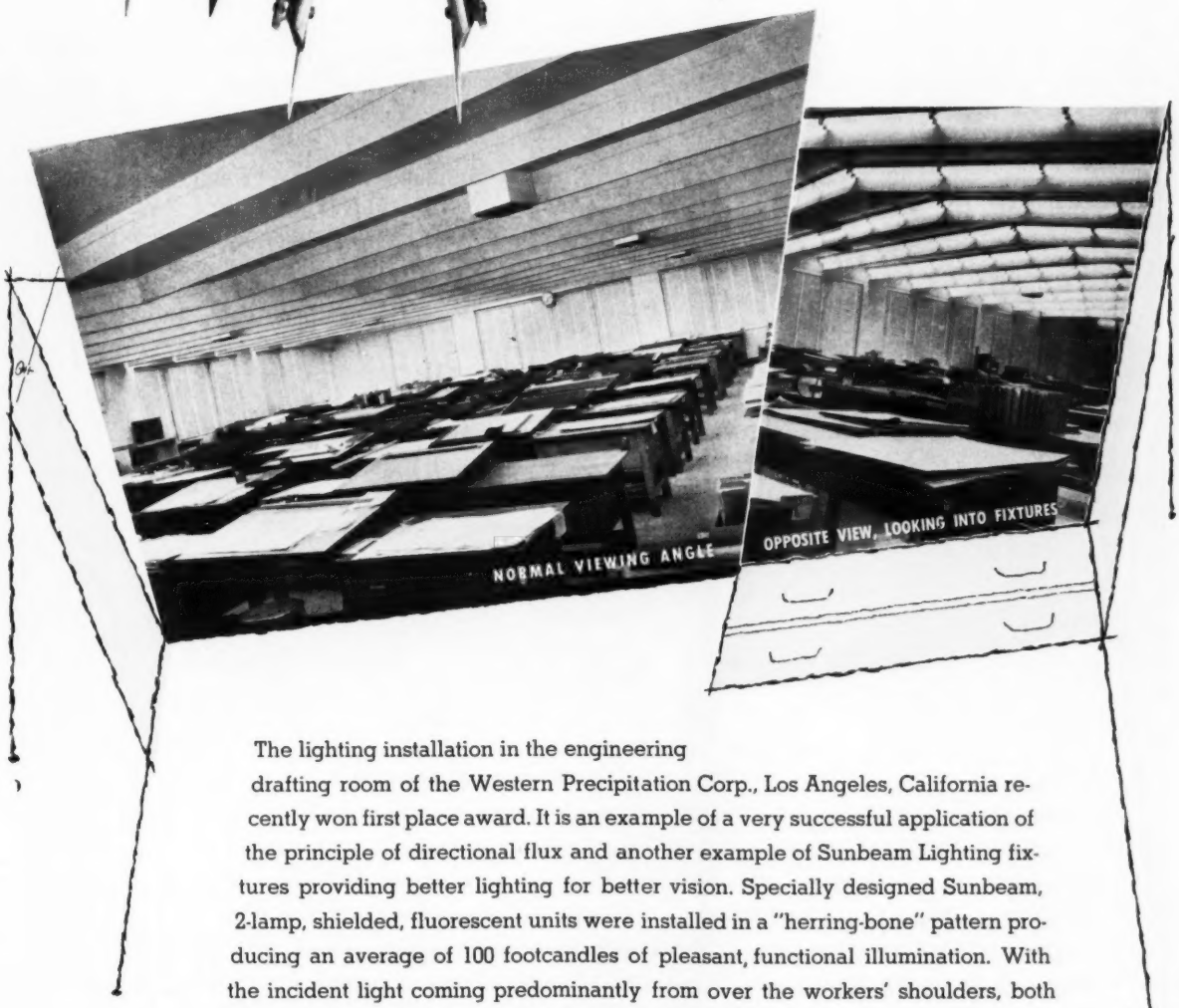
ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST & 120 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH, 1301 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY



ALL DRAFTSMEN AGREE

that better lighting
for better seeing
means better work.



The lighting installation in the engineering drafting room of the Western Precipitation Corp., Los Angeles, California recently won first place award. It is an example of a very successful application of the principle of directional flux and another example of Sunbeam Lighting fixtures providing better lighting for better vision. Specially designed Sunbeam, 2-lamp, shielded, fluorescent units were installed in a "herring-bone" pattern producing an average of 100 footcandles of pleasant, functional illumination. With the incident light coming predominantly from over the workers' shoulders, both direct and reflected glare was all but eliminated and shadows around triangles and "T" squares greatly minimized.

SUNBEAM visionaire LIGHTING COMPANY

SUNBEAM LIGHTING COMPANY • 777 EAST 14TH PLACE • LOS ANGELES 21, CALIFORNIA

"Cut costs with Buckeye Conduit-- it bends so uniformly!"

MIDWEST CONTRACTOR TALKS ABOUT CONDUIT: "When I pay good money for workers, I want the utmost in production. That's why I use Youngstown "Buckeye" conduit. My men bend and install "Buckeye" in short order without wasting precious time."

ELECTRICAL WHOLESALER DESCRIBES BUCKEYE CONDUIT: "My customers tell me that bending "Buckeye" evenly takes a minimum of time and effort. This enables them to cut down on overtime work. As far as I'm concerned, I recommend "Buckeye" highly."

Youngstown makes rigid steel conduit from start to finish. This enables Youngstown to control the complete manufacturing process which insures that each length of "Buckeye" Conduit is made of topgrade steel. Since only high quality steel makes for easy bending, it's no wonder Youngstown "Buckeye" conduit is favored by electrical men.

Shipments of "Buckeye" rigid steel conduit are now being made from our conduit mills at Indiana Harbor and Youngstown.

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

Export Office - 500 Fifth Avenue, New York

COLD FINISHED CARBON AND ALLOY BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

Comparison Proves You Can Reduce Regulation Costs

Check These Figures
4160 Volt Y Substation Load of 3000 Kva, Two 200 Amp Radial Feeders
Cost of ±10% Regulation
Single-phase Feeder Regulation with six 200 ampere Station Regulators $15,492
3-phase Feeder Regulation with two 150 Kva Station Regulators $14,304
3-phase Bus Regulation with 3-phase Station Regulator $9775
3-phase Bus Regulation with LRC on 3000 Kva Step-down Transformers $8362
Single-phase Feeder Regulation with six 200 amp Distribution Regulators $7356
ALLIS-CHALMERS
5/8% STEP
VOLTAGE REGULATORS

This Single Example Shows How You Save At Least

$1006.00

Over Previous Lowest Cost Equipment

The economy story above is just one reason why it will pay you to re-evaluate voltage regulation for your system. Changes in system economics brought about by Allis-Chalmers distribution regulators may add up to better regulation and lower costs.

In many cases you can now bring the advantages of individual phase regulation to every feeder in a system. Both utility and consumer benefit. You get ± 1 volt accuracy, 20% range of regulation. You can increase revenue — and profits.

Get High Quality Regulation

Allis-Chalmers distribution regulators bring you all the advantages of 20 years of regulator progress. You can get more facts on these low-cost, reliable units — plus a set of six cost comparison charts to help analyze your system — by calling your nearby A-C district office or writing Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4044

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

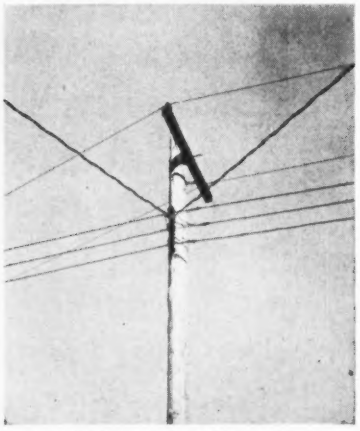
Rome Aluminum Triplex

Triplex Self-Supporting Secondary and Service Drop Cable—Regularly supplied with stranded or solid all-aluminum power conductors, insulated with RoPrene (Neoprene) and incorporating ACSR or other suitable bare neutral messenger. All-aluminum, copper or copperweld messengers are also available. RoLene (polyethylene) insulation can be supplied in place of RoPrene.

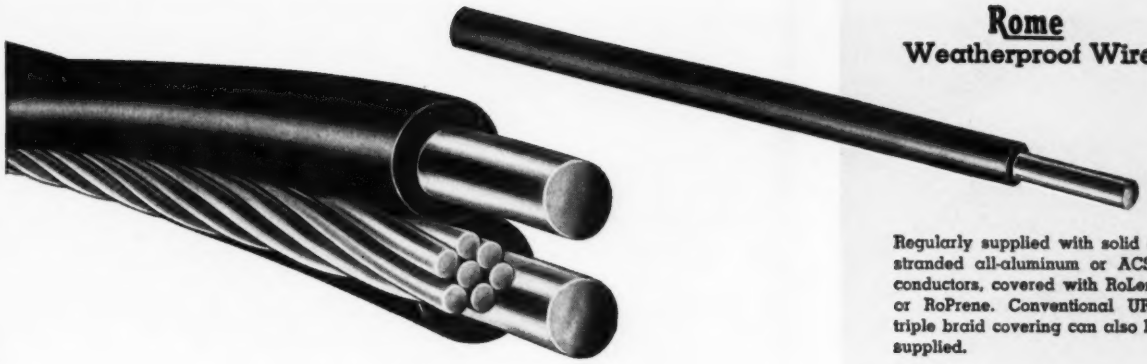
Rome Triplex Service Drop Cable provides neat, clean looking installation in new homes area.

Triplex is ideal for replacements on older houses too, particularly where eaves and roofs pose space problem.

Rome Triplex is less subject to damage by storm and falling tree limbs . . . will remain in operation SAFELY even when down.



Installation at pole and house is easy and quick, cutting costly manhours and permitting less expensive hardware.



Rome
Weatherproof Wire

Regularly supplied with solid or stranded all-aluminum or ACSR conductors, covered with RoLene or RoPrene. Conventional URC triple braid covering can also be supplied.

OFFERS YOU A HOST OF COST ADVANTAGES

Many applications of Rome Aluminum Triplex secondary and service drop cable show outstanding cost advantages over conventional bare or weatherproof open wire construction.

For one thing, by proper mechanical design it may eliminate one-third to one-half the number of poles normally required. This adds up to a substantial saving. Further, it is also possible to utilize mid-span connections for service drops.

Rome Aluminum Triplex is particularly desirable for new residential developments. It is neat in appearance while mechanical design and light weight minimize sag tendencies. This cable construction, with its strong messenger, also affords greater protection against wind and ice loading damage.

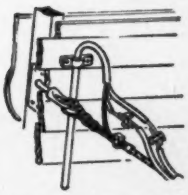
Fewer accessories are needed for secondary and service drop connections than for open wire construction. Maintenance is less costly; conductors are easily accessible.

Longer service life is assured because of mechanical design. RoPrene (Neoprene) and RoLene (polyethylene) insulation have exceptional resistance to weather and all climatic conditions. There are no braids to rot or festoon. Replacement is minimized.

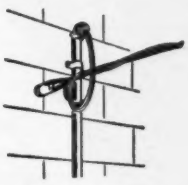
So whether it's secondary or service drop cable or weatherproof wire for distribution, Rome Aluminum offers you a host of advantages. May we send you samples?

Typical Connections

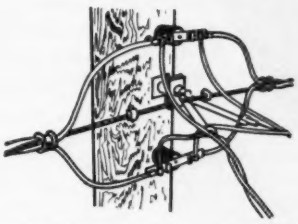
Service connection



Built-in attachment for dead-ending.



Dead end (house)



Service tap (from secondary cable)

It Costs Less to Buy the Best

Rome ALUMINUM

ROME CABLE CORPORATION, ROME, N.Y., AND TORRANCE, CALIF.

WESTERN SALES OFFICES AND WAREHOUSES

SALT LAKE CITY 1, UTAH
230 South 4th West St.

EAST LOS ANGELES 22, CALIF.
2510 South Malt Avenue

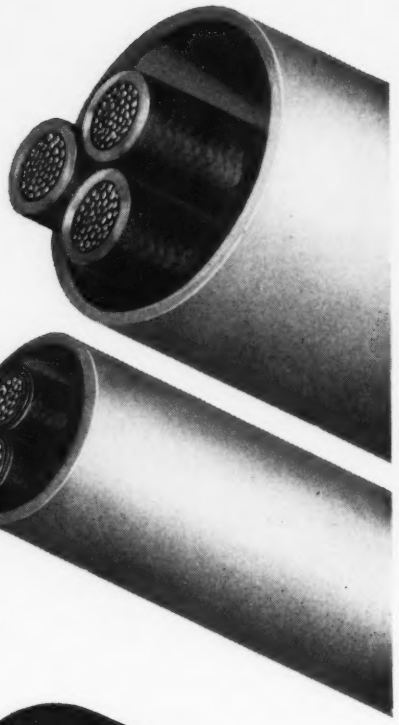
SAN FRANCISCO 24, CALIF.
1100 Selby Street

SEATTLE 4, WASH.
3430 Fourth Ave., So.

DENVER 3, COLO.
1160 Elati St.

PORTLAND 5, ORE.
1020 S. W. Taylor St.

LOAD FOR LOAD!



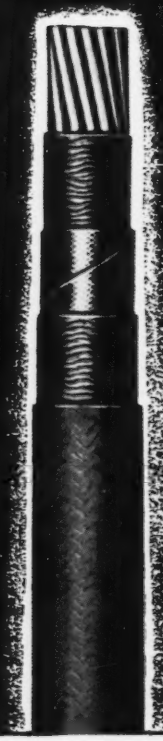
ROCKBESTOS A.V.C.®
(N.E.C. TYPE AVA)
COSTS LESS INSTALLED

For example, take a 430 ampere load at 40°C Ambient temperature. To use type RH cable, an 800 MCM is required but with Rockbestos A.V.C. (AVA), a size 500 MCM cable carries the same load and is 38% smaller.

Three 800 MCM type RH cables requires a 4" conduit, while with Rockbestos A.V.C. (AVA), a 3" conduit does the job. What's more, the quicker, easier handling of lighter-weight Rockbestos A.V.C. (AVA) reduces labor costs substantially.

Compared size for size, Rockbestos A.V.C. (AVA) helps you increase capacity simply by rewiring old conduits. No new larger conduit, fittings and accompanying labor are needed.

To get the full story on the practical advantages of Rockbestos A.V.C. (AVA) high ampere cable—write for the booklet "—Cut Cable Costs."



IT'S THE A.V.C. CONSTRUCTION THAT MAKES THE DIFFERENCE

Inner Felted Asbestos Wall

Varnished Cambric

Outer Felted Asbestos Wall

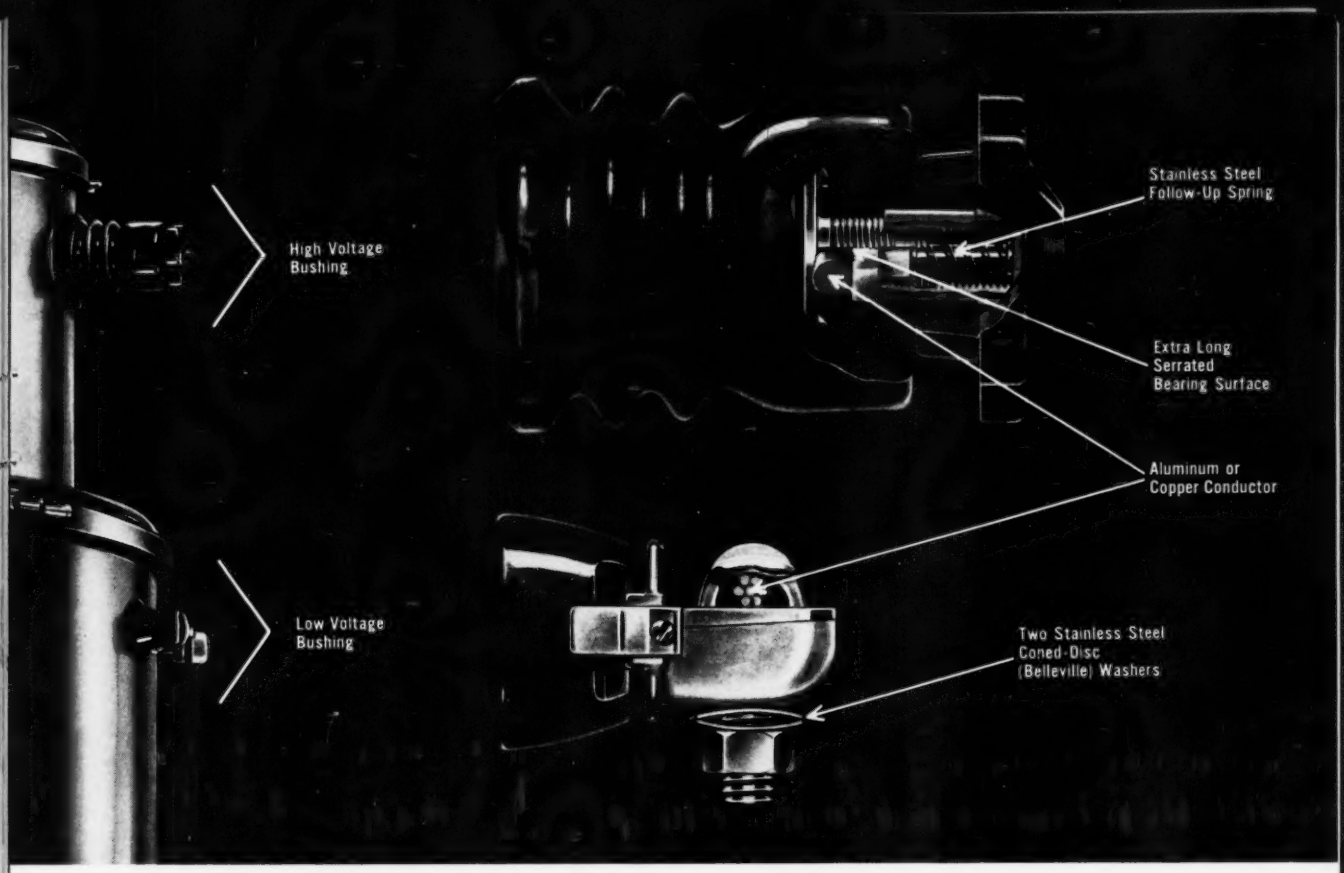
You can get life-long dependable service under severe operating conditions because these walls of impregnated felted asbestos permanently resist heat and moisture, mechanical damage and effectively seal the high dielectric varnished cambric tapes from deterioration.

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT
CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

...Your best buy

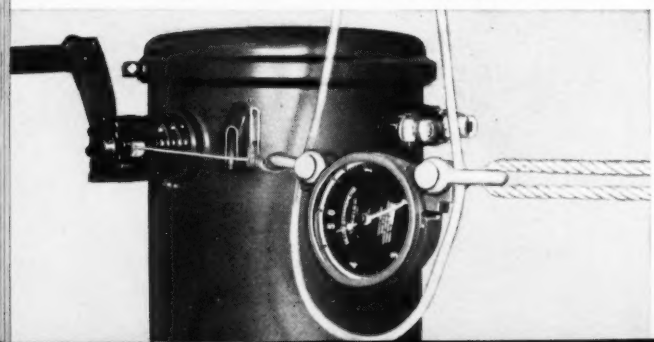

High Voltage Bushing
Low Voltage Bushing
Stainless Steel Follow-Up Spring
Extra Long Serrated Bearing Surface
Aluminum or Copper Conductor
Two Stainless Steel Coned-Disc (Belleville) Washers

G.E. ANNOUNCES new transformer connectors for either copper or aluminum conductor

General Electric has redesigned the connectors of both high- and low-voltage bushings on all pole-type distribution transformers. The new connectors engage either copper or aluminum conductor without requiring special fittings. The connectors prevent loosening of connections by "cold-flow" and temperature changes.

High-voltage tank-wall bushings have a stainless-steel follow-up spring inside the porcelain and an extra-large serrated bearing surface, which securely grips the wire and breaks down the aluminum oxide. The spring maintains pressure on the conductor, even when cold-flow occurs (see test photo below). In connecting a transformer, the spin-free knob on the bushing is tightened in the usual manner.

Test on new G-E connector with follow-up spring. With bushing connector relaxed to simulate a 10% creep in No. 6 aluminum conductor, clamp holds wire without any movement under stress of 200 pounds.



Low-voltage and high-voltage cover bushings have two stainless-steel, coned-disc spring (Belleville) washers. These washers maintain pressure on the conductor in the same manner as in the high-voltage tank-wall bushings.

These design changes answer the problem of "cold-flow." In addition, all copper-alloy parts are tin-plated to prevent galvanic action of the connectors when in contact with aluminum. In areas where salt or chemical fumes are unusually severe, however, transitive adapters should be used with aluminum conductors.

These new bushing connectors will be supplied as standard on all G-E pole-type distribution transformers. EEI-NEMA recommended terminal openings will be maintained.

For more information on these new connectors, contact your nearest G-E Sales Representative, or write General Electric Company, Section 431-11, Schenectady 5, N. Y.

1879 75 1953 YEARS OF ELECTRICAL PROGRESS

You can put your confidence in—

GENERAL ELECTRIC

DISTRIBUTION TRANSFORMERS
different from others because.....
NEW

.....Magne-valve arrester

(gapped valve-type) can be used any place on your system...regardless of short-circuit currents

Small in size and light in weight, the new General Electric Magne-valve arrester has impulse characteristics similar to those of G.E.'s modern pellet arrester—the quality standard of performance in the electrical industry. The new arrester—gapped to the bushing in the same manner as modern pellet arresters on unit-type 2400- and 4800-volt transformers—is now standard on all G-E EEI-NEMA 7200- and 7620-volt unit-type transformers.

NEW ARRESTER FEATURES:

Valve action—Thyrite* valve action is augmented by magnetic action of an internal series gap.

External gap—No 60-cycle voltage across arrester under normal operating conditions—no chance for grounding circuit if arrester is damaged.

Elimination of unnecessary breaker tripping—Unlike expulsion-type arresters, there is no short circuit during discharge and no erosion to limit the useful life of the arrester.

Small size and light weight—9-kv arrester, for 7200-volt transformer, is only 14¼" long, weighs only 10 pounds.

REMEMBER . . . all transformers are not alike . . . compare the General Electric plus features in the chart below and see for yourself.

For more information contact your nearest G-E sales office or agent, or write General Electric Company, Section 431-9, Schenectady 5, New York.

Reg. trade-mark of General Electric Company

You can put your confidence in—

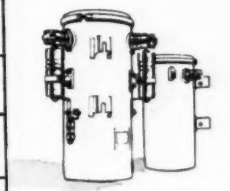
GENERAL ELECTRIC

ALL TRANSFORMERS ARE NOT ALIKE

(make this simple comparison and see)

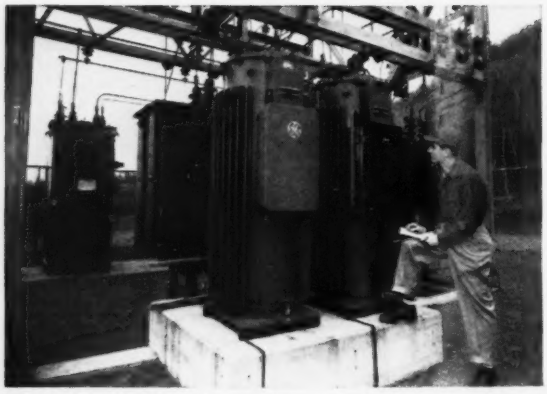
FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	YES	NO	NO	NO	NO	NO
Nitrile rubber gaskets at all tank openings	YES	NO	NO	NO	NO	NO
Strenicor pressure terminal clamps	YES	NO	NO	NO	NO	NO
Insulated clamp-type connectors on tank wall hv bushings	YES	YES	YES	NO	YES	YES
One-piece cover band	YES	NO	NO	NO	NO	YES
Gapped valve-type arresters	YES	NO	NO	NO	NO	NO
Nationwide company-operated service facilities	YES	YES	NO	NO	NO	NO

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

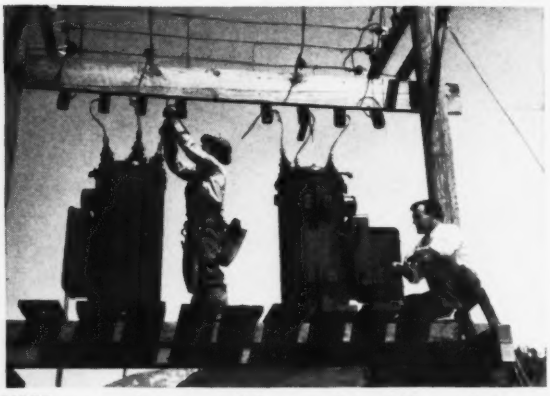


UNIT-TYPE CONVENTIONAL

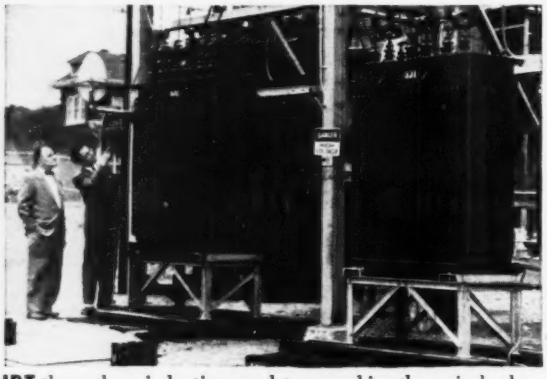
"Take your choice G.E. makes both"



IRS single-phase induction regulators supply the finest regulation obtainable for heavily loaded feeders where voltage variations are frequent and immediate response essential. Their sealed tank construction prolongs oil life.



ML32 step regulators provide low-cost dependable regulation on branch and rural circuits in thirty-two 5/8% steps. As with all G-E station-type voltage regulators, controls of the ML32 maintain Class I accuracy.



IRT three-phase induction regulators combine three single-phase IRS regulators in one tank with a single set of controls. They provide high quality stepless regulation for balanced loads. Rugged construction assures long life.

MLT32 three-phase step regulators adjust voltage in thirty-two 5/8% steps. Best suited for lines with balanced loads, they feature rugged simplicity in construction—accessibility and ease of maintenance of switching mechanism.

Solve any feeder voltage problem with one of these G-E regulators

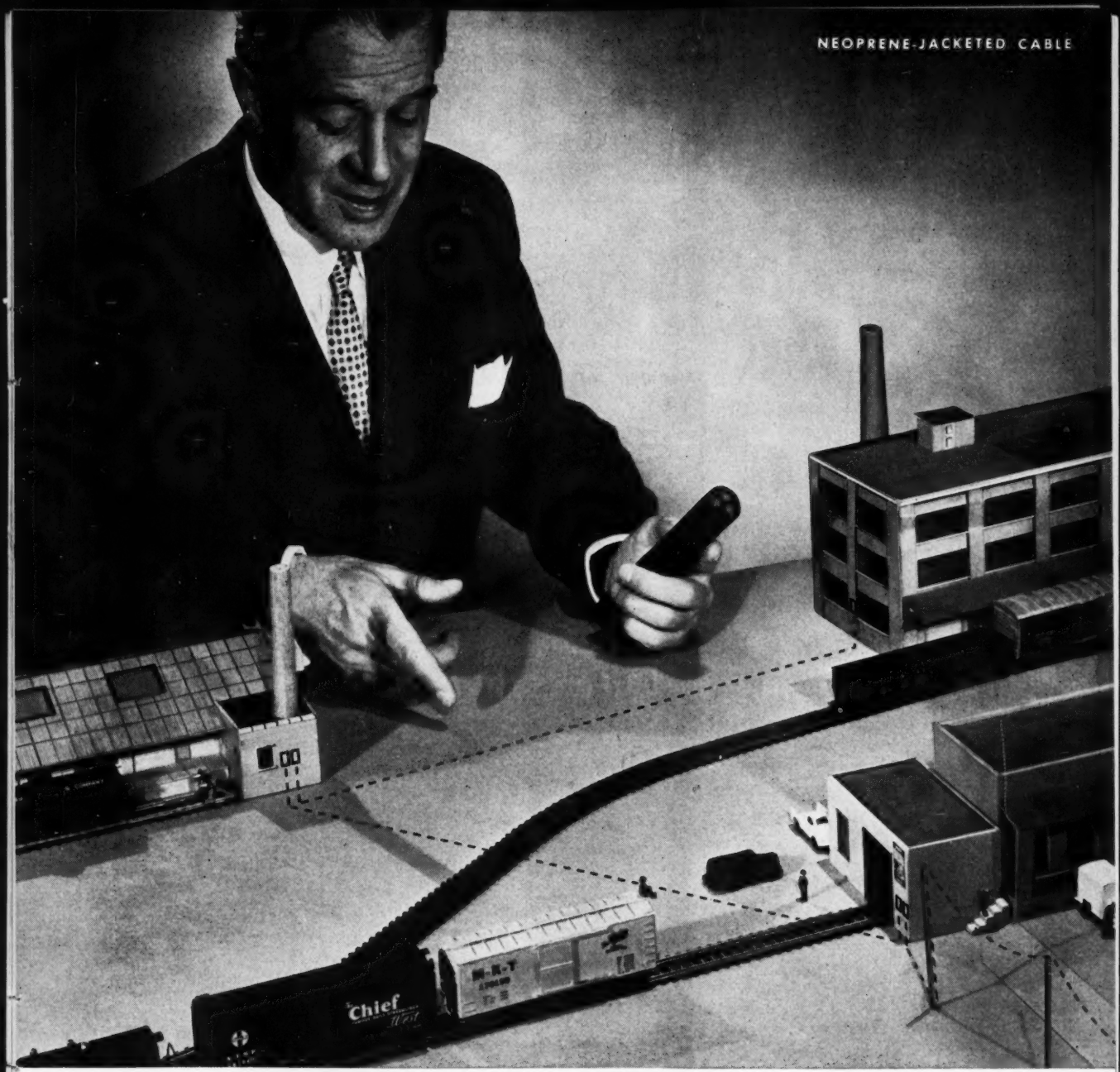
You can get exactly the type of voltage correction you need . . . dependable, low-cost regulation . . . the finest regulation obtainable . . . for circuit capacities from 125 kva at 2.4 kv to 25,000 kva at 69 kv . . . by choosing from General Electric's complete line of voltage regulators.

G-E Induction Regulators, with their prompt response to voltage variations, smooth stepless control, and negligible maintenance, provide the highest quality regulation obtainable. They're available for circuits 15 kv and below, 3000 kva and below . . . single phase for individual phase control . . . three-phase for balanced loads.

G-E Step Regulators offer economic advantages where you handle large blocks of power at higher voltages, and where you need supplementary regulation on your branch and rural feeders. G.E.'s MLT32 three-phase step regulator is available for all standard voltages up to 69 kv, circuit capacities up to 25,000 kva . . . ML32 single-phase regulators offer ±10% regulation in thirty-two 5/8% steps in ratings 13,800Y/7960 volts and below, for three-phase banks rated approximately 2000 kva and below.

For more information on IRS, IRT, MLT32, ML32 regulators, see your local G-E representative or send for bulletins GEA-2985, GEA-2985C-1, GEC-716, GEA-5752, respectively. General Electric Company, Schenectady 5, New York. 423-2

GENERAL ELECTRIC



Durasheath: saves needless power-line jointing

Why complicate cable installations by shifting from buried to duct or aerial types in industrial plant feeder lines? Flexible, easily handled DURASHEATH* Cable can cut your costs. You can run this tough, versatile cable underground directly in the earth, overhead or in ducts (or in any combination) without needless, time-consuming jointing. Its light weight and flexibility make duct pulling fast even in zero weather. Aerial assemblies go faster. Linemen like to work with it. You stock only one cable type – all-purpose DURASHEATH.

* * *

As one of several types of ANACONDA power cables, DURASHEATH is available in all sizes, single or multiconductor, copper or aluminum, from 600 to 15,000 volts. It is thoroughly dependable for industrial plants, railroads, series or multiple street lighting, airport† lighting, residential primaries and secondaries, as well as for such uses as Type USE cable for underground service entrance. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off. 53312

ANACONDA®

Primary and secondary distribution cables • building, machine tool, control and communication wire • portable cords and cables • bus-drop cables • apparatus cables • copper, aluminum, copperweld conductors • wire and cable accessories.

†*When ordered to CAA Specification L-824*

ANACONDA ON THE PACIFIC COAST: Plant at: Orange, Calif. District Offices at: Los Angeles, Calif.; San Francisco, Calif.; Seattle, Wash.

WIDE ACCEPTANCE

of these L-M HEAVY

50 amperes, 8000 amperes interrupting capacity

100 amperes, 14,000 amperes, interrupting capacity

200 amperes, 20,000 amperes interrupting capacity

Two years ahead of other manufacturers, L-M announced a line of heavy duty "PHD" fuse cutouts with interrupting capacities up to 20,000 amperes. Today, their wide acceptance all over the country proves the need for these cutouts designed especially for heavy duty service.

Here is the first complete line of cutouts for high capacity distribution feeders—designed and built especially for heavy duty service.

Reasons for This Wide Acceptance

Here are some of the reasons why these Line Material "PHD" (porcelain heavy duty) cutouts have been so widely accepted:

1. L-M was first in the industry with a complete line of heavy duty box cutouts having realistic and usable interrupting capacities.
2. Users have confidence in interrupting capacity ratings assigned.
3. Elaborate and detailed testing was conducted over a two-year period prior to manufacture.
4. L-M has paid special attention to the largest and smallest of design details, such as cementing, contact alignment, door and cartridge positioning—all of which govern successful cutout operation.
5. "PHD" cutouts are safe to use. They interrupt high fault currents successfully and eliminate danger of exploding porcelain.
6. These cutouts are designed to clear high fault currents as well as low fault currents, thereby insuring service continuity.

"PHD" is a Line Material Company trademark

PROVES THE VALUE

DUTY CUTOUTS

50 amperes, 4000 amperes, interrupting capacity

100 amperes, 8000 amperes interrupting capacity

Customers Like HD Cutouts

From three utility companies who are using "PHD" cutouts come these comments:

"We're ordering nothing smaller than 100 ampere boxes and no cutout with less than 10,000 amperes interrupting capacity."

"We've standardized on the 5000/8000 ampere rating for overall use—in close to substations, the 'PHD' 100 ampere cutout with 10,000/14,000 amperes rupturing capacity will be used exclusively."

"The 'PHD' 200 ampere cutout with up to 20,000 amperes interrupting capacity certainly helped us out of a jam. We use it to protect feeders tapped off high capacity buses."

Here's Complete "PHD" Line

5 kv Rating	Interrupting Capacity rms amperes	
	2.5 kv*	5 kv**
50 amps.	8,000	5,000
100 amps.	14,000	10,000
200 amps.	20,000	15,000
7.5 kv	**Interrupting Capacity**	
50 amps.	4,000 amperes	
100 amps.	8,000 amperes	

*2.5 kv or line-to-neutral 4160 or 4330 volts Gr. Y. **5 kv or line-to-neutral 8330 volts Gr. Y.

Get Complete Information

If you aren't already using "PHD" cutouts, ask the L-M Field Engineer for a Bulletin; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

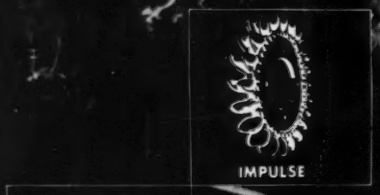
LINE MATERIAL

LM®

fuse cutouts and fuse links

In Fifty Countries . . .

BALDWIN TURBINES develop over 1,000,000 h.p.



No matter what your power plant requirements might be, there are four important reasons why you should turn to Baldwin for the answer to your hydro-electric development problems:

1. Baldwin-Lima-Hamilton Corporation has at its disposal a wealth of experience dating back to the early days of the Pelton Water Wheel Co., a present Baldwin subsidiary, and the I. P. Morris Co. which manufactured its first turbine equipment in 1841.
2. They offer you a complete range of available capacities . . . small, fractional horse power water wheels to the largest units that can be shipped.
3. Since their line includes all four basic types of turbines (at left), Baldwin engineers can make an unbiased recommendation of the type best suited for your conditions and needs.
4. Baldwin and Pelton can supply other hydraulic machinery: surge suppressors; butterfly, needle, spherical and relief valves; large capacity low head pumps.

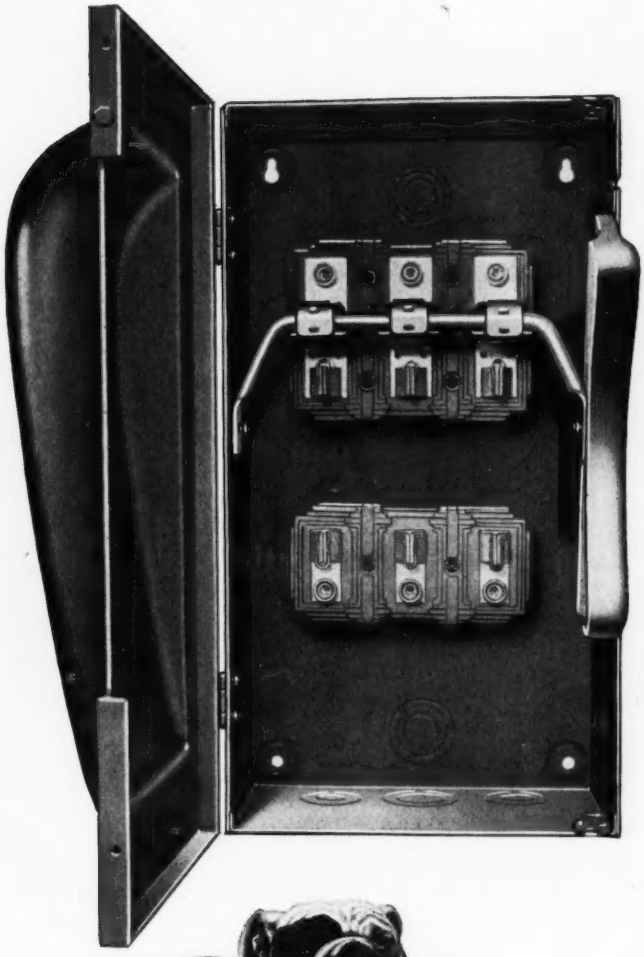
You'll enjoy and profit from reading Baldwin Bulletin 1000 which devotes all 24 pages to pictures and data on typical Baldwin turbine installations. Please write to Dept. 5053, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

Philadelphia 42, • Offices in Principal Cities

BULLDOG VACU-BREAK SAFETY SWITCHES



wide open wiring spaces

Extra-large wiring gutters are but one of the many thoroughbred features which make BullDog Vacu-Break Safety Switches easier and cheaper to install and maintain.

BullDog's silvered wire grips—cold-forged from pure copper for maximum strength and conductivity—help make wiring in these roomy gutters a snap . . . save valuable time.

Unequalled protection is yours, too, with BullDog switches because BullDog's exclusive Vacu-Break Arcing Chamber smothers dangerous arcs before they can damage or heat up the contacts. And patented Clampmatic contacts mean bolt-tight contact connections . . . give you a smoother operating, cooler switch.

BullDog's simplified line of Vacu-Break safety switches handles all requirements. Write today for free Bulletin SS-250 containing complete information. BullDog Electric Products Company, Dept. EW 73, Detroit 32, Michigan.

©BEPCO

THOROUGHBRED IN ELECTRICAL EQUIPMENT

BULLDOG
ELECTRIC PRODUCTS COMPANY

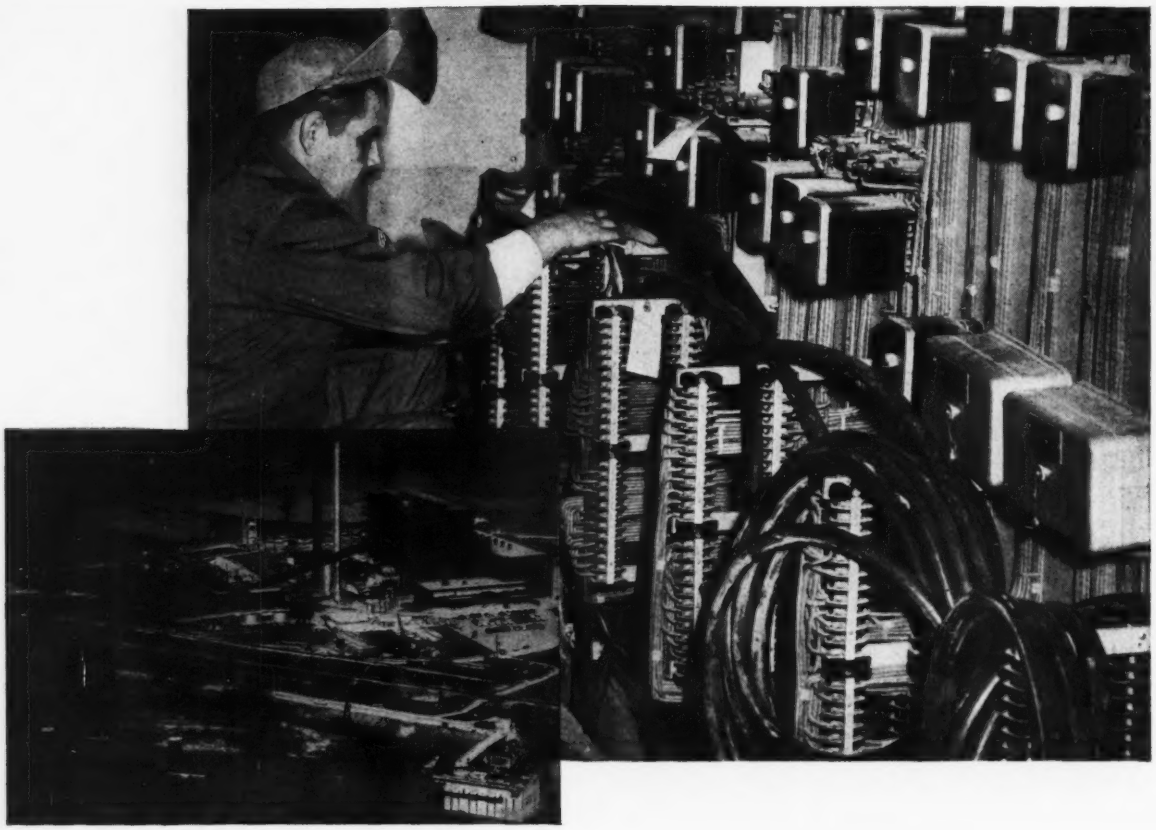
CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES

Coast Electric & Manufacturing Company
1720 N. E. Sixth Avenue—Tel. TUxedo 5191
Portland 12, Oregon

Safety Switchboard Company
1445 Stevenson St.—Tel. HEmlock 1-2470
San Francisco 3, California

BullDog Electric Products of Los Angeles
2885 East Washington Blvd.
Los Angeles 23, California

Young Electric & Manufacturing Company
2134 Curtis Street
Denver 2, Colorado



OKOLITE-OKOPRENE

used in new MERAMEC POWER PLANT

LOCATED on the banks of the Mississippi below St. Louis, the new Meramec Plant of the Union Electric Company of Missouri is another fine example of modern power plant engineering and construction. Every component, from the terminals to the two 110,000 KW turbines, was selected for quality and durability.

Following a trend that has become almost a national practice today, Okolite-Okoprene wires and cables were purchased. Virtually all the single and multi-conductor control cables are Okolite-Okoprene, as are the low voltage power cables and the lighting feeders.

You will find that Okolite-Okoprene cables give dependable performance in every service, whether in new installations or for replacement. For full information, write for Bulletin WE-1056. The Okonite Company, Passaic, New Jersey.

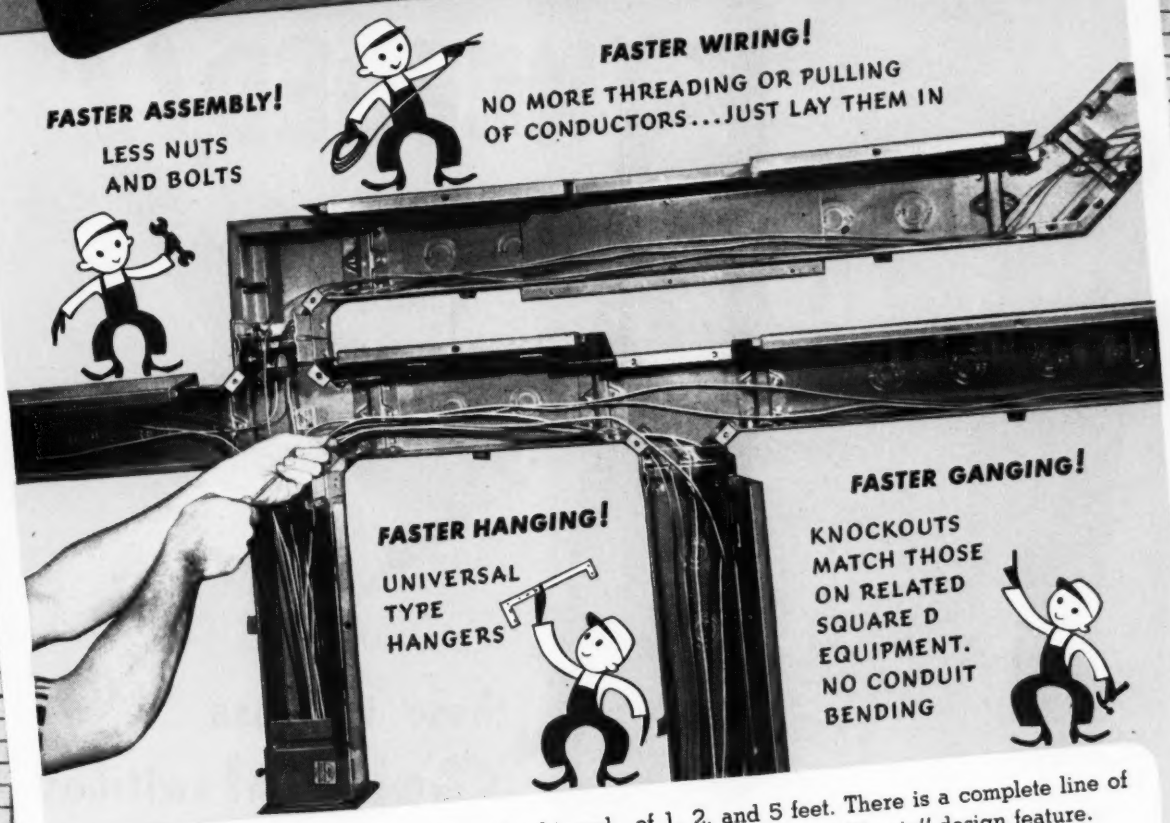
OKONITE SINCE 1878 *insulated cables*

75th ANNIVERSARY

1747

INSTALL WIREWAYS FASTER!

SQUARE D's NEW AND EXCLUSIVE *Lay-in Duct*


FASTER ASSEMBLY!
LESS NUTS AND BOLTS
FASTER WIRING!
NO MORE THREADING OR PULLING OF CONDUCTORS...JUST LAY THEM IN
FASTER HANGING!
UNIVERSAL TYPE HANGERS
FASTER GANGING!
KNOCKOUTS MATCH THOSE ON RELATED SQUARE D EQUIPMENT. NO CONDUIT BENDING

Square D's exclusive design provides hinged covers for both the duct sections and connectors. Easily removable fitting covers then provide a completely unobstructed wireway in which to lay wires.

LAY-IN DUCT is available in 2½" x 2½", 4" x 4", and 6" x 6" sizes, in standard lengths of 1, 2, and 5 feet. There is a complete line of fittings, all with the "lay-in" design feature.

• • •

Write for the complete story of **LAY-IN DUCT**—how it gives you a better wireway system, easier, faster and at less cost. Address Square D Company, 4335 Valley Blvd., Los Angeles 32, Calif.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

1903 • **50** YEARS OF DESIGN LEADERSHIP • 1953

Watch for Square D's Display Coach—Now on Tour!

NO DESCRIPTION NEEDED!

those who use **General** switches

know why...

they are without equal!

WRITE FOR CATALOG #5201

General
Switch Corp.
49 Roebling Street Brooklyn 11, N. Y.

ENCLOSED SAFETY SWITCHES
SERVICE ENTRANCE EQUIPMENT
BRANCH CIRCUIT PANELS

SPANG®

THE COMPLETE LINE OF TOP-FLIGHT CONDUIT . . .

AT YOUR SERVICE!

. . . for easier bending . . . for easier threading . . . for better installation . . . for more profits . . .

SPANG Conduit gives you these advantages because it is made of top-grade, quality-controlled steel, formed under exact heat conditions and inspected constantly during manufacture.

The care that goes into the manufacture and delivery of SPANG Conduit right up through the time it arrives at your distributor's makes SPANG a real quality-controlled product. When you ask for SPANG, you get a top-flight product . . . clean, workable, with years of dependable service built into it.

Ask any electrical contractor about SPANG Conduit—he'll tell you *why* SPANG is better!

CENLACO . . .

hot dipped and lacquered rigid steel conduit, easy to work and bend . . . exceptional corrosion-resisting properties. Couplings hot dipped zinc coated with electro-galvanized threads.

SPANG EMT . . .

lightweight steel tubing with the new SPANGLEAM electro-galvanized exterior finish for better appearance and the new interior coating of resinous lacquer compounded with Zirconium for easy wire pulling, assured grounding and corrosion resistance. Easy to cut, bend and install.

CENTRAL BLACK . . .

Black enamel rigid steel conduit, easy to work and bend . . . surfaces will not crack, chip or flake under the most severe bending strains. Couplings pickled before application.

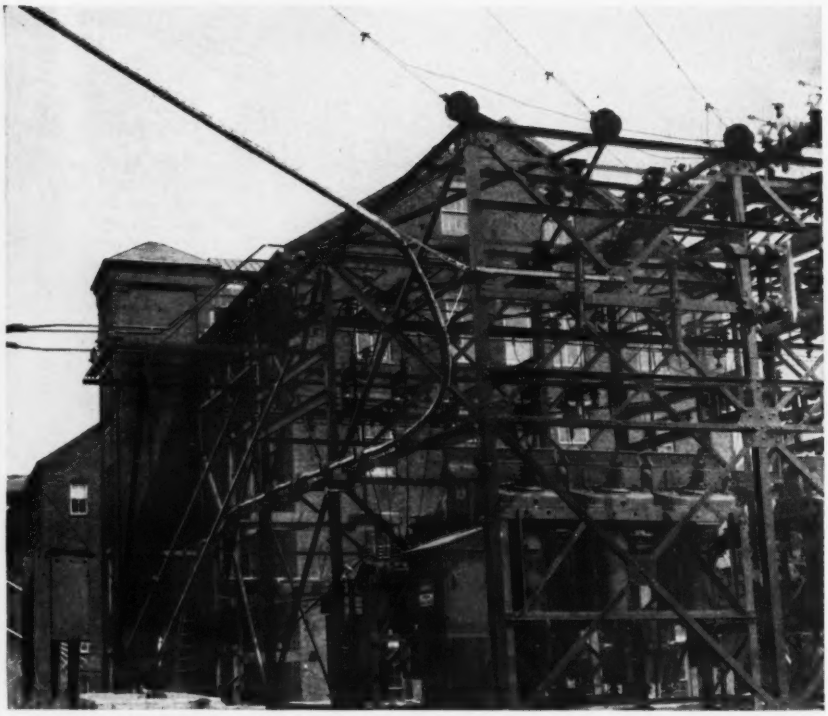
CENTRAL WHITE . . .

Electro-galvanized rigid steel conduit, easy to work and bend . . . interior coating of black enamel assures a smooth surface, making an ideal raceway for easy wire pulling.

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities

"neither snow, nor rain, nor heat...."



These famous words* carved over the main entrance of the New York Post Office very aptly apply to the public utility systems of this country.

Distribution systems of public utilities must be as dependable and constant as the proverbial postman in his appointed rounds. That's why it is false economy to buy distribution wire and cable of any kind that isn't the most dependable that money can buy. It isn't a question of whether you can afford to buy the best; the question should be turned around, "Can you afford not to buy the best?"

For high voltage circuits, we think you are practicing false economy if you don't install cables insulated with Simplex-ANHYDREX XX. These cables can be used underground in or out of ducts, or overhead on messenger wire. They are heat, ozone, water and age resistant. They are rated for operation at 80°C. in wet or dry locations at voltages from 2,001 to 17,000 V.W.P.

Why don't you insure the continued operation of your distribution circuits by installing Simplex-ANHYDREX XX Cables now?

** The complete quotation is, "Neither snow, nor rain, nor heat, nor gloom of night stay these couriers from the swift completion of their appointed rounds."*

Simplex WIRES & CABLES

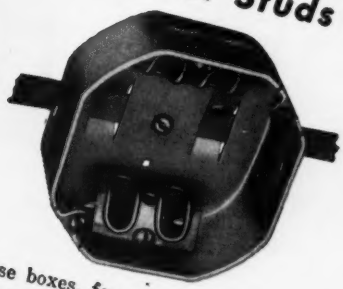
SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

Two New UTILITY BOXES with Extra Wiring Space

Permitting the use of heavy duty switches or receptacles and allowing ample space for easy wiring. For these boxes are six overlapping covers.

WHAT'S NEW at Steel City

Four New BAR-SET BOXES Without Studs



These boxes, for non-metallic conduit and armored cable, are held in position on the bar with set screws and are priced for a saving when studs are not needed.

A New Line of INSULATING BUSHINGS

that meet, in full, the requirements of the National Electric Code and help to do

BETTER JOBS QUICKER

at a lower cost

. . . and This Book giving detailed and well-illustrated information on Steel City Switch Boxes, is yours for the asking.

For more information on these new items and a copy of the Switch Box Book, fill in and mail the coupon.

STEEL CITY ELECTRIC COMPANY

Please send us . . .

- ☐ Copy of Switch Box Book

More information on . . .

- ☐ New Utility Boxes
- ☐ New Bar-set Boxes
- ☐ New Insulating Bushings

Name.....

Address.....

.....

STEEL CITY ELECTRIC CO.

PITTSBURGH 33 PENNSYLVANIA

ELECTRICAL BOXES AND CONDUIT FITTINGS

KINDORF DEVICES FOR INSTALLING CONDUIT

NEW

OIL CIRCUIT BREAKERS

Here's the inside story of recent improvements in this time-proved breaker. This breaker has long been used for outdoor distribution service where safe, reliable operation is a necessity. Now it is even more easily installed and maintained. This means a further reduction in your circuit breaker service costs because of the following features. A-4074

1. New "full view" doors open to expose three sides of operator cabinet—not just one.
2. Gasketed doors make cabinet completely weatherproof.
3. Cabinet is enlarged to house accelerating adjustment mechanism, solenoid operator and connecting linkage. Accelerating spring is easily accessible.
4. Simplified operator and pole unit mechanisms. Fewer parts now used for simplicity — added reliability.
5. Maintenance closing handle can be used from either front or side of control cabinet. This means breaker may be used in confined area.
6. Shielded vitreous enameled space heater provided.
7. Manual trip now located higher on back of cabinet to help prevent accidental tripping.
8. Simplified transformer wiring duct. Removal of single bottom plate of wiring duct exposes continuous transformer leads along full length of duct.
9. Self-aligning tulip and bayonet contacts retained.
10. Contacts are at convenient level — no interference from the frame.
11. Thoroughly proved *Ruptor* arc-interrupting device retained.
12. Easy tank removal! There is no interference from frame.
13. Individual rectangular tanks occupy less space, using less oil and providing best electrical clearances.
14. Tank lifter mounted on back — operated from either side.
15. Grounding pad is stainless steel faced.

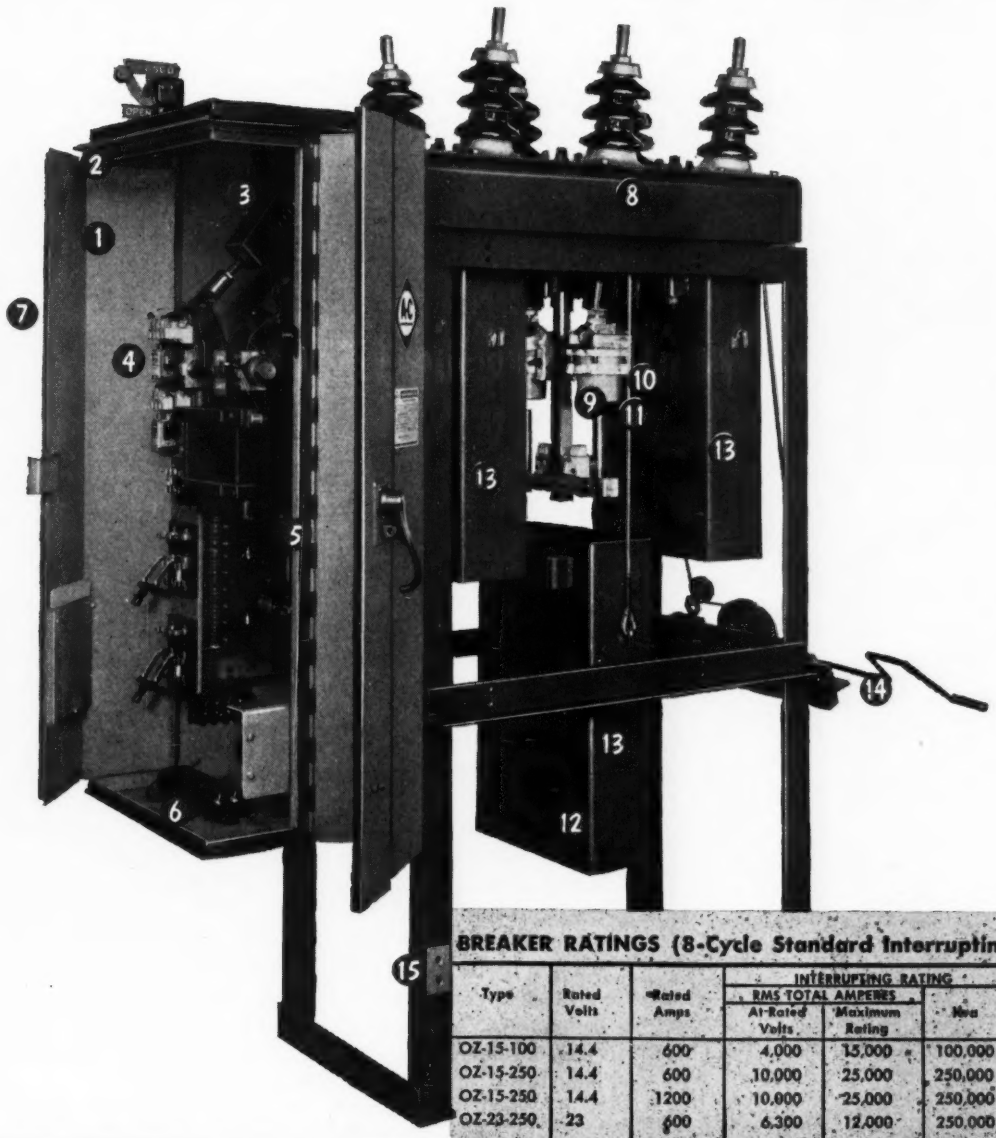
Standard outdoor automatic reclosing relay equipment and cabinet are available.

Ruptor is an Allis-Chalmers trademark.

ALLIS-

Accessibility

For Inspection...Test...Maintenance



BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Volts	Rated Amps	INTERRUPTING RATING RMS TOTAL AMPERES At Rated Volts	Maximum Rating	Mva	Weight of Breaker With Oil (lbs)
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

CHALMERS

A-C ALLIS-CHALMERS

Proven best when needed most—

SHELL DIALA OIL AX

the inhibited insulating oil

Carry the highest load, the longest period of time with the oil that's tailor-made to lengthen service life

Shell Diala Oil AX actually "fights" oxidation. Because of this you can get 3-5 times the usual service life on all your electrical equipment—even during peak overload periods—without frequent oil purification and costly maintenance!

Because it is made specifically to do this job, Shell Diala Oil AX outperforms all insulating oils, either conventional or inhibited. It gets its superiority from a base oil that's specially refined to get the most from Shell's powerful inhibitor.

Harmful catalytic effects of iron and copper are minimized in Shell Diala Oil AX—even under high operating temperatures. Moisture and carbon settle out rapidly leaving dielectric strength *high*.

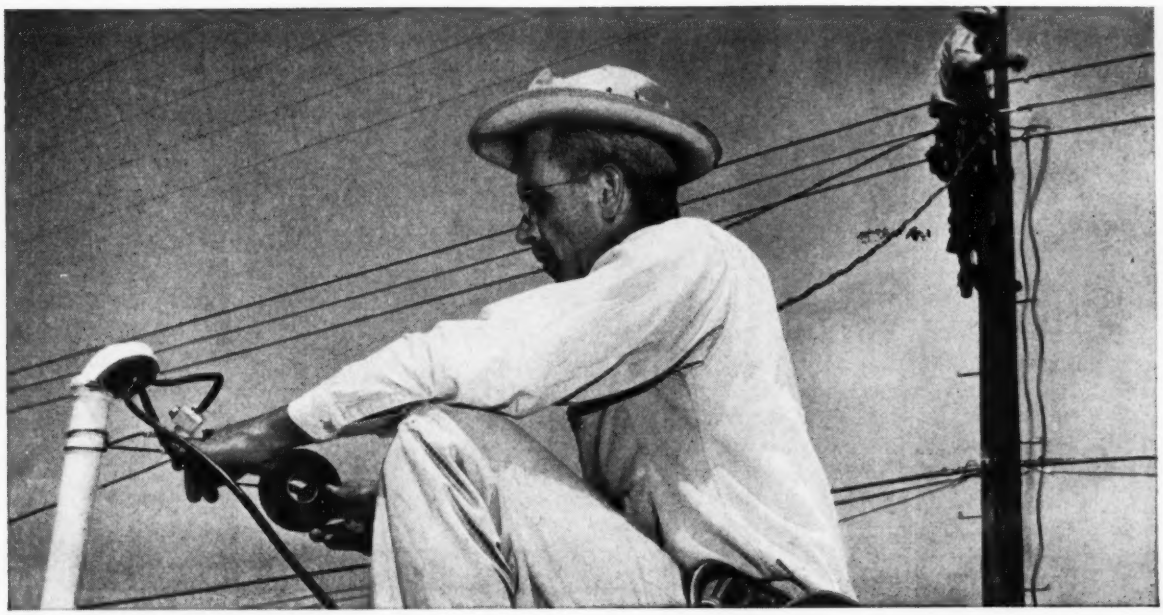
Because of its stability, electrical insulating properties remain *high* and heat transference is unimpaired. Yes—Shell Diala Oil AX keeps right on protecting your equipment even under the toughest conditions. *First* in the field, Shell Diala Oil AX has proven *best* in the field!

SHELL

You'll be money ahead to switch to **SHELL DIALA OIL AX** *right now!*

It's Economy to specify aluminum conductor

It's economy when you specify aluminum conductor because: Aluminum costs less than copper. Aluminum is light in weight; it strings easier and faster—helps cut installation costs. Aluminum's lightness reduces strain on house, pole and fittings—minimizes costly maintenance and repair. Your total savings with aluminum conductor can be *as much as 35%!*



It's Big Economy to specify Kaiser Aluminum conductor

IT'S BIG ECONOMY when you specify Kaiser Aluminum conductor because unsurpassed engineering services help you do a better job at lower cost.

Field Service—Experienced Kaiser Aluminum linemen work hand in hand with your crews on stringing jobs; demonstrate ways to speed installations and cut costs; make continual inspections.

Engineering Service—Kaiser Aluminum engineers and specialists help keep your crews up to date on latest construction techniques; help solve specific installation problems; furnish sag-and-tension charts on request.

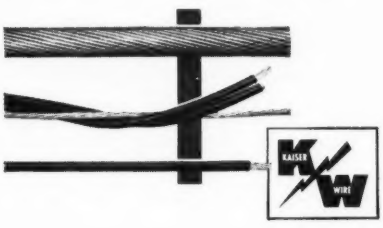
Accessory Service—Kaiser Aluminum laboratories will, when necessary, evaluate accessory problems on your particular jobs, recommend accessories and installation procedures designed to give you maximum service and economy. They also offer assistance on any phase of your operations requiring fundamental research.

You get this *complete service at no extra cost* when you specify Kaiser Aluminum conductor. Act now! Contact any Kaiser Aluminum office in principal cities, or one of our many distributors. Request these free pamphlets: 1) Tips on making good connections with aluminum conductors, 2) applications of Kaiser Aluminum Triplex Cable. Kaiser Aluminum & Chemical Sales, Inc., Oakland 12, California.

Report on Savings with Kaiser Aluminum!
After switching to Kaiser Aluminum *Triplex* Cable from three open wire type service, 10 utilities reported the following *typical labor* savings:

	OPEN WIRE	TRIPLEX CABLE	SAVING
Company "A"	$8.00	$4.00	$4.00
Company "B"	8.00	4.00	4.00
Company "C"	7.80	4.80	3.00
Company "D"	9.00	4.50	4.50
Company "E"	8.00	6.00	2.00
Company "F"	8.00	6.00	2.00
Company "G"	8.00	6.00	2.00
Company "H"	8.00	4.00	4.00
Company "I"	8.00	4.00	4.00
Company "J"	8.00	6.00	2.00

Average labor saving per service drop $3.15



Kaiser Aluminum

setting the pace—in growth, quality and service

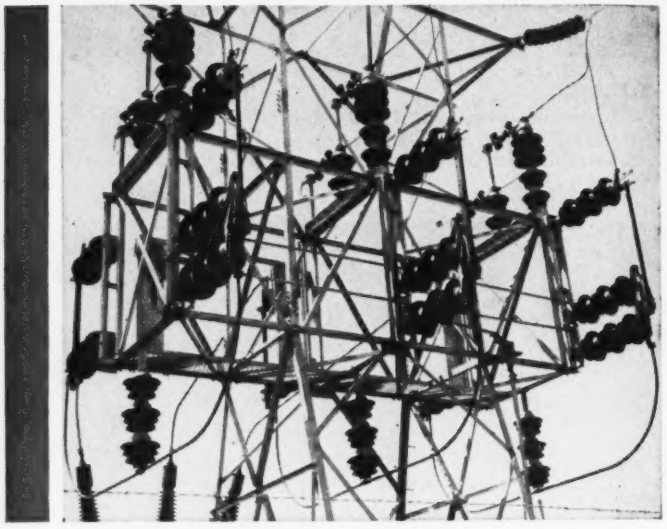
NEOPRENE AND POLETHYLENE COVERED CONDUCTOR, SOLID AND STRANDED
SELF-SUPPORTING TRIPLEX CABLE • ACSR • ALL ALUMINUM CONDUCTOR

Schwager-Wood Group Operated

VERTICAL BREAK SWITCHES TYPE TA

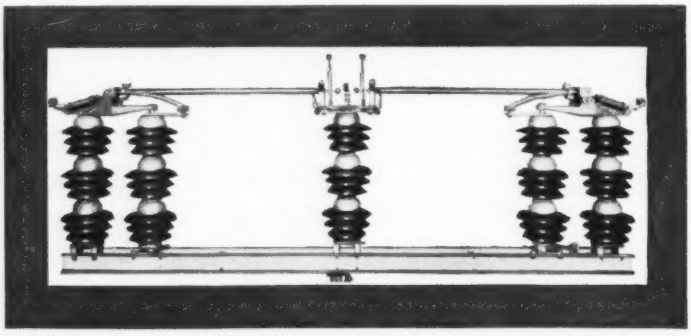
7.5 KV through 330 KV 400, 600, 1200, 1600, 2000 and 3000 Amperes

• Extra long breaking distance is achieved in the design of Schwager-Wood Type TA Switches by hinging the blade over the rear stack of insulators. This feature has contributed largely to their popularity. The increased breaking distance ranges from 75% in a 7.5 KV switch to 30% in a 115 KV, over a conventional design. Longer transmission lines can be dropped and heavier load or exciting currents can be interrupted than would be possible in switches with the blade hinged over the center insulating stack.



Illustrative of the versatility of Schwager-Wood Type TA Switches is the fact that the relocation of a single pin, in the counter balance mechanism, changes operation from horizontal to vertical—and vice versa.

Illustrated below is a Schwager-Wood Type TA single pole bus selector switch—115 KV—600 Ampere. Selector switches are available in all voltage and amperage ratings.



Technical information and prices available on request from any of our regional representatives or the home office, 8024 S.W. 35th Avenue, Portland 19, Oregon. Phone CHerry 7588

SCHWAGER-WOOD CORPORATION

High Voltage Switchgear • Substation Design, Equipment • Bus Fittings, Connectors **PORTLAND, OREGON**

BAY CITY, MICHIGAN
P. O. Box 287
Johnson Sales Co.
Phone 3-6413

BILLINGS, MONTANA
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Victor L. Wisoki
Phone 9-3175

BIRMINGHAM, ALABAMA
447 American Life Bldg.
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Phone 7-1017

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P. O. Box 8071
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100 13th Avenue
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Phone 7-4769

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Phillips Electric Eqpt. Co.
Phone 5-7933

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Charles L. Ward Co.
Phone VAlentine 8895

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Russell D. Heath
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Charles L. Ward Co.
Harold E. Bates
Phone VIctor 3-3737

PASADENA, CALIFORNIA
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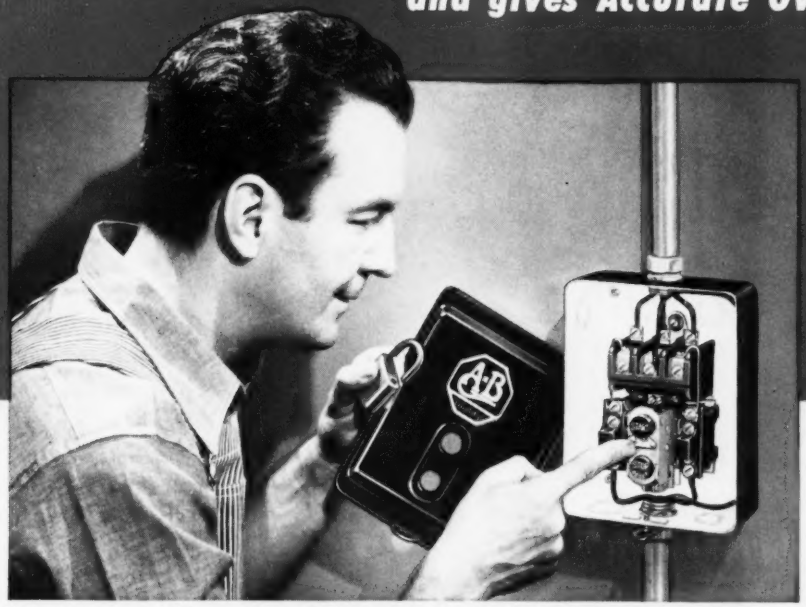
Clarence W. Silver Co.
Phone 5-5378

SAN FRANCISCO, CALIF.
461 Market Street
K. M. Ryals Co.
Phone YUkon 2-5510

TACOMA 2, WASHINGTON
1914 Market Street
Love Electric Co.
Phone BR 4104

A MANUAL MOTOR STARTER
that's Push Button Operated...
and gives Accurate Overload Protection



Maintenance man is locking stop button in OFF position before padlocking cabinet cover. All Bulletin 609 Manual Starters have this safety first feature. It protects man, motor, and machine.

For Single and 3 Phase Motors up to 5 hp, 220 v; 7½ hp, 440-550 v

Bulletin 609 Switch with arc hood raised to show three double break, silver alloy contacts.

Bulletin 609 Starters have a quick make, quick break switch mechanism that is actuated manually with two push buttons. Two accurate overload breakers automatically open the switch in case of sustained overload.

The double break, silver alloy contacts require no cleaning, filing, or dressing. Bonderized pressed steel cabinets resist rust under ordinary plant conditions. For damp or dusty places the special cabinets, shown below, assure long, trouble free life. Millions of Bulletin 609's are in daily use. Write for bulletin.

5-53-M

Available in enclosures for every type of service

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

BULLETIN 609 MANUAL MOTOR STARTERS

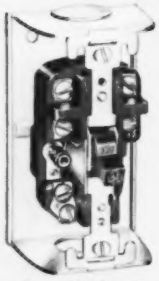
QUALITY

Standard toggle lever switch

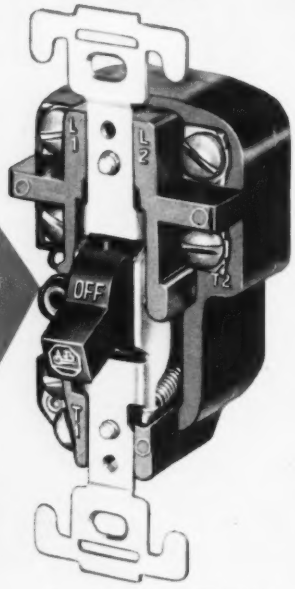
Key operated for added safety

Linkage lever switch

Form 51-52 with pilot light

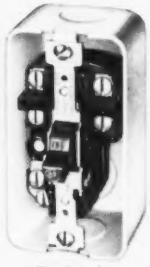


Form 51-52 with cover off



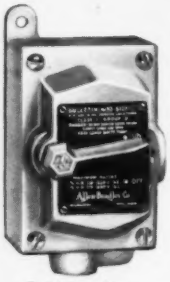
OVERLOAD BREAKER

Close-up of Bulletin 600 switch mechanism, showing thermal overload breaker. These switches are available with one or two poles.



Fits handy switch box

In watertight enclosure



For hazardous gas locations

Fits flush switch box

A BIG LINE OF SMALL STARTING SWITCHES

with Overload Protection for Motors up to 1 hp

The Bulletin 600 Starting Switch gives overload protection to small a-c and d-c motors on unit heaters, stokers, fans, compressors, and small electric tools. It is a popular and fast selling starting switch.

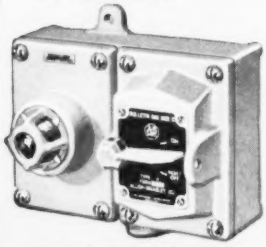
The overload breaker automatically trips the switch in case of sustained overload. The switch cannot be held closed until the overload on the motor is cleared.

To reset the overload breaker, the switch lever is moved to OFF position. The motor can then be restarted by moving the switch lever to the ON position. Therefore, no time is wasted replacing fuses.

Bulletin 600 Starting Switches are available in many forms of enclosures, a few of which are shown above. For complete data please send for illustrated Bulletin 600, today.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

Form 72 unit with selector switch



Form 62 watertight enclosure with pilot light

ALLEN-BRADLEY

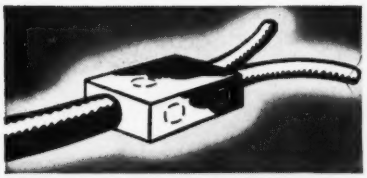
BULLETIN 600 STARTING SWITCHES

QUALITY

A-B Quality

5-53-M

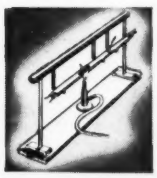
How to get longer life out of your portable cords and cables!



1 **USE** junction or distribution boxes for making multiple power connections in working places.

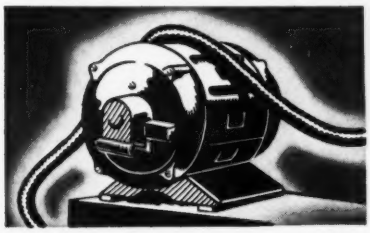
2 **PROTECT** cables with fuses or circuit breakers of the proper rating for the service. Make sure that circuit breakers will operate properly.

3 **PROTECT** cables from being run over by heavy equipment. Running over the cable a few times may not cause immediate failure, but may do internal damage which will shorten its life. If the cable must be run across an aisle, place boards on either side as one would for a hose. If it is in use for only a short time, it should be thrown over the truck.

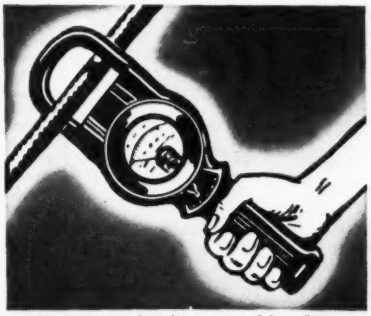


4 **USE** flame-resistant cables wherever possible.

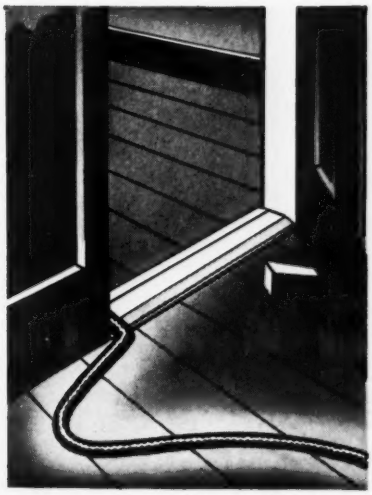
5 **DO NOT** have portable cords and cables running over steam pipes or other heat-transmitting equipment.



6 **KEEP** cables away from sparking motors and high voltage equipment. The ozone generated by sparking commutators attacks rubber jackets, causing cracking.



7 **AVOID** overloading of cables. Where possible, use I.P.C.E.A. recommended current ratings.



8 **AVOID** dragging portable cords around rough edges or sharp corners. Bruises and cuts hasten deterioration of the jacket. Never yank cords to remove kinks or loosen them when caught on a projection.

9 **AVOID** running portable cables on pulleys or drums too small for the size of the cable; observe recommended I.P.C.E.A. minimum diameters.

10 **KEEP** cords away from oils and greases. If they do get into oil, they should be wiped off as soon as possible. Avoid having cords lie in pools of water, chemicals or grease.

11 **BUY** cables that can carry the required current without overloading or overheating. They should be flexible (have sufficiently fine strands) for the intended use.

FOR FREE REPRINTS OF THIS PAGE, WRITE TO ADDRESS BELOW.

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Electrical Wire and Cable Department

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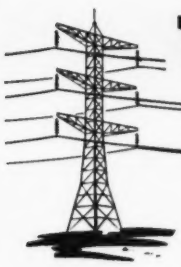


This Important Revenue Builder is Setting Growth Records...

Hotpoint

Deluxe Food Freezers

With the number of home food freezers on electric utility meters almost doubled during the past two years, and the saturation up 60% in that time, the Hotpoint Deluxe Food Freezer is an appliance that warrants the serious attention of all electric utility companies.

Here is an appliance that works for you 24 hours a day . . . not just at peak periods. In very few instances are trade-ins necessary. The demand for freezers is relatively uniform in all sections of the country . . . throughout the year . . . no peaks and valleys. It's the appliance most homemakers intend to buy next.

The same outstanding engineering skill that goes into all Hotpoint Appliances is incorporated in the Hotpoint Deluxe Food Freezer. The same Hotpoint tradition of unquestioned quality sets the Hotpoint Freezer apart in the Freezer industry. Hotpoint Food Freezers are available in all popular sizes in the chest-type models and in the new 10.5 cubic foot upright model. All models provide features that guarantee maximun efficiency, convenience, durability, and dependability. Have the Hotpoint distributor show you why it will pay you to put your support behind Hotpoint Food Freezers for added revenue . . . today and tomorrow.

Again Hotpoint looks at Tomorrow, Today

HOTPOINT Co. *(A Division of General Electric Company)* ***5600 West Taylor Street, Chicago 44, Illinois***

DROP-FORGED for GREATER STRENGTH

BTC

M.P.L. Aluminum

SUSPENSION CLAMP

for A.C.S.R.
and All-Aluminum Conductors

MINIMUM POWER LOSS

INCREASED CONDUCTOR LIFE

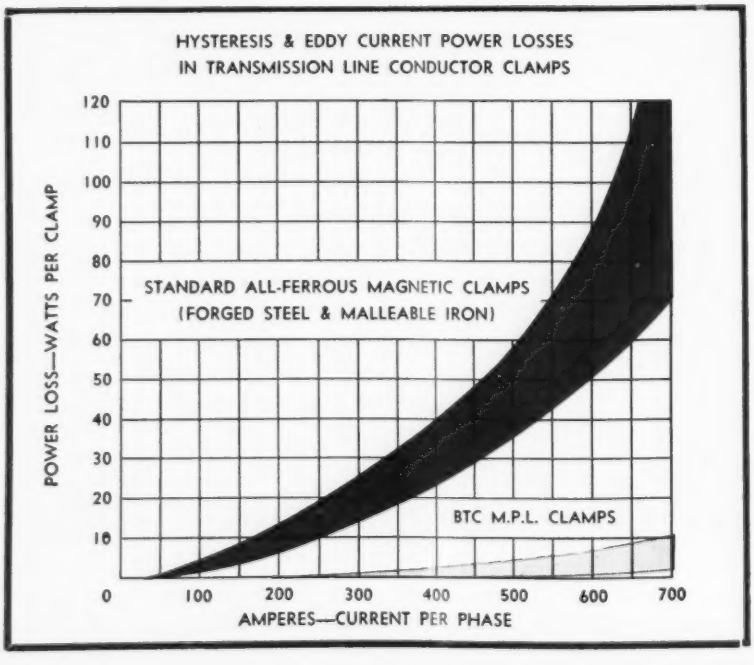
STRONGER

MPL **MINIMUM POWER LOSS**

The use of non-magnetic Aluminum Alloy Clamp Body reduces eddy current and hysteresis losses to a minimum . . . prevents temperature rise in the clamped section of the conductor, which will operate at lower temperature than in the span.

CONSIDERABLY STRONGER

Forgings, in any metal, are employed where better strength, soundness and finish are required than can be obtained by other processes. Forging produces a fine, close-grained structure, with the grain flow following the contour of the part and with optimum mechanical properties and ability to withstand severe loading, sudden shock and frequent reversal of stress.

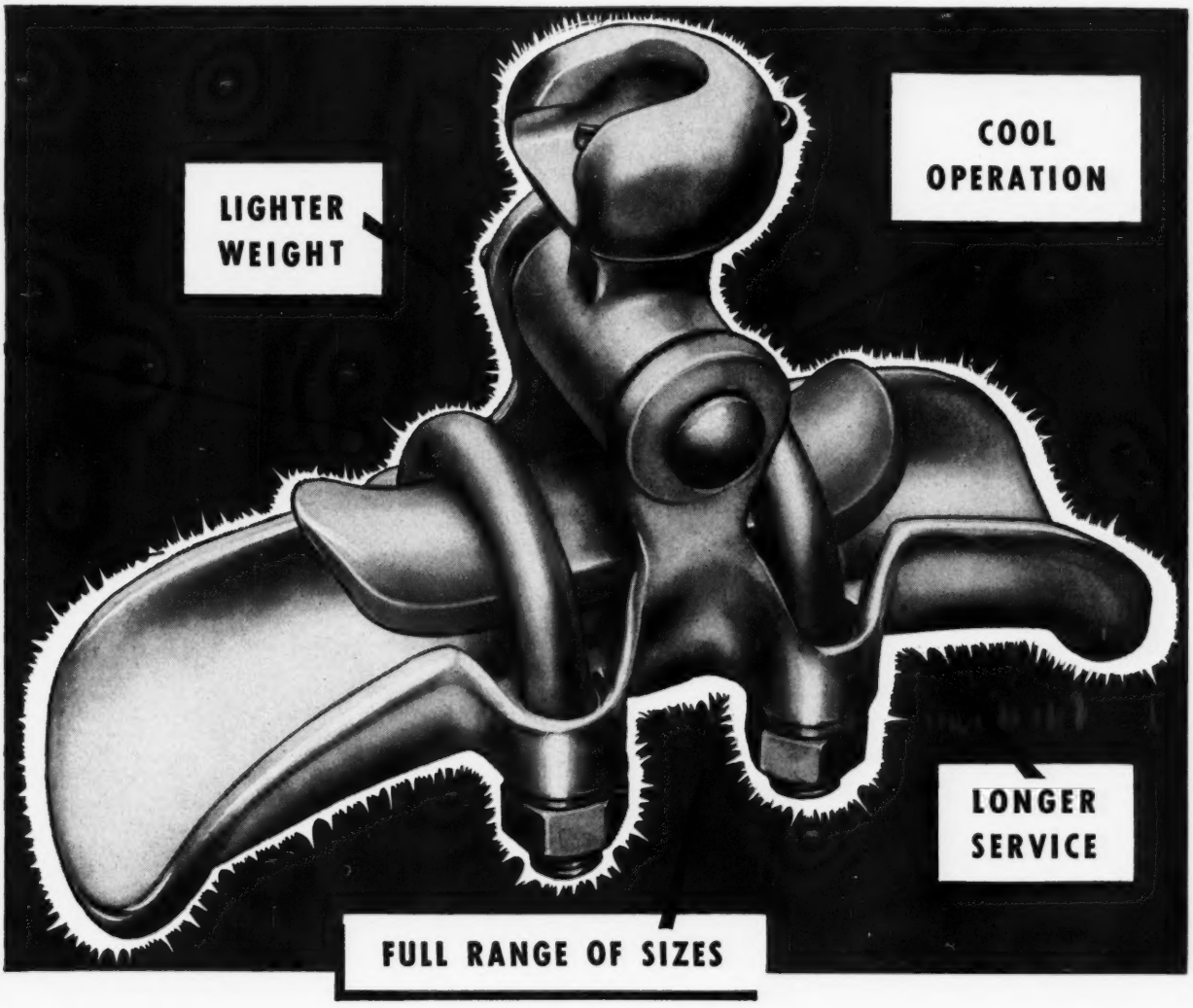


The BTC Clamp Body is FORGED Aluminum alloy, the strongest recommended for the purpose, fully heat-treated to develop maximum mechanical properties.

In the heat-treated condition, the ultimate strength and hardness is more than twice . . . and the yield strength and endurance limit more than three times . . . that of alloys used in other processes. The more-than-adequate catalouged strength ratings of BTC Clamps are conservative and are exceeded in actual tests.

LIGHTER WEIGHT

Heavy sections or reinforcing ribs, necessary in other materials to develop desired strength and prevent collapse or breakage of the clamp under clamping U-Bolt pressure, are not required in forged clamps. Undesirable weight is eliminated without sacrifice of strength.



INCREASED CONDUCTOR LIFE

The light weight and generous longitudinal radius of the conductor seat minimize the effects of conductor vibration. The conductor is not bent over a small radius at any point.

Clamping pressure is greatest at the center, gradually decreasing toward each upswept end of the keeper. Clamp and Keeper ends are liberally bell mouthed and beaded to prevent conductor damage and formation of corona.

The conductor is fully supported in the clamp body. There are no open pockets at U-Bolt holes to allow distortion of the conductor under clamping pressure.

LONGER SERVICE

The superior strength insures against failure under severe loading. The greater hardness prevents excessive wear at points in contact with the supporting pin.

The close-grained, non-porous structure of the forged clamp body effectively prevents the destructive internal seepage of corrosive elements, a cause of failure in some transmission line fittings produced by other processes.

FULL RANGE OF SIZES

BTC offers a choice of exactly the right clamp for each size of A.C. S.R. or all-aluminum conductor. The close dimensional fidelity of the die-forged and die-formed parts makes unnecessary any bore size allowance for manufacturing variations in the clamps.

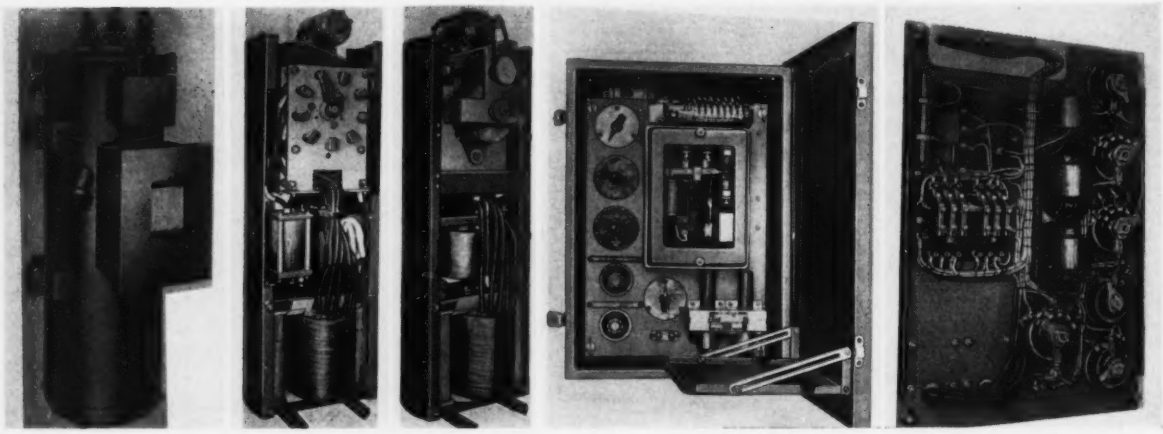
Specify BTC MPL Aluminum Suspension Clamps from your insulator manufacturer. They are an important part of BTC's complete line of forged transmission line hardware.

Sold Through Your Insulator Manufacturer Only

Drop Forged BTC *Hi-Line Hardware*

The **BREWER-TITCHENER**
Corporation
Cortland · New York

PRODUCT NEWS



Type PRS pole-type step-voltage regulator, its internal construction (both switch and drive mechanisms) and the control equipment

Pole-Type Step-Voltage Regulators

(1) Moloney Electric Co., St. Louis 20, Mo.

Voltage regulation of plus or minus 10% is provided in 32 equal steps of 5/8% of rated voltage by the type PRS pole-type regulator. According to the manufacturer, it is completely self-contained and automatic in operation; need only be connected into the system. The single-phase, 60-cycle unit comes in voltage rating adaptable to a variety of installations and is said to be specially suitable for branch and rural distribution lines.

Operation of the regulator is monitored by a sensitive control system, capable of distinguishing between poor regulation and sporadic voltage variations, the manufacturer points out. Regulation is performed by a series of tapped windings, a drive mechanism and switching mechanism.

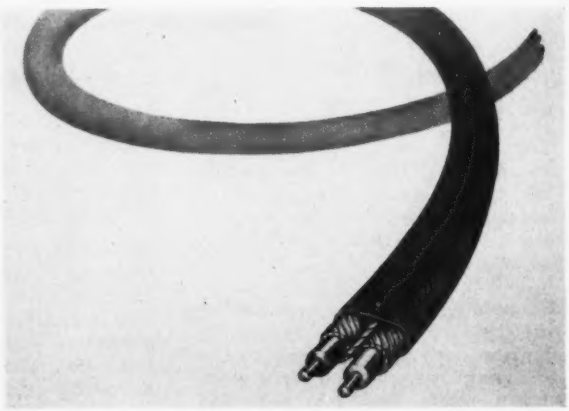
The motor-driven selector switch is the heart of the regulator. The switches or terminals of the tapped winding are arranged in a circle and are mounted in parallel on two identical mounting panels said to reduce appreciably the over-all size of the regulator. The selector switch determines the magnitude to which the tapped winding will buck or boost the output voltage. The reversing switch determines the polarity of the tapped winding as to whether it will buck or boost the output voltage.

Magnet Wire for Use in Dry-Type Transformers

(2) John A. Roebling's Sons Corp., Trenton 2, N. J.

A new type of magnet wire insulation developed specifically for applications in electrical equipment that require Class B insulation has temperature characteristics, dielectric strength, toughness and workability suitable for Class B transformer windings and for use in other types of electromagnetic devices designed for operation up to 105 C. This Roetemp magnet wire is insulated with Irv-O-Bestos, a specially processed tape with high heat-resisting characteristics. This insulating tape is applied in a single wrap with approximately 25% overlap and is bonded firmly to the conductor.

This magnet wire is rated for a continuous operating temperature of 105 C, with a hot-spot temperature of 125 C, but the insulating material is claimed to retain its desirable characteristics and bonding agents are said to retain firm grip at temperatures far in excess of this rating. A four-page bulletin gives details.



Nonmetallic Sheathed Cable

(3) Columbia Cable & Electric Corp., 255 Chestnut St., Brooklyn 8, N. Y.

An improved nonmetallic sheathed cable, Columbia-Flex, features a slick, tack-free, battleship grey coating claimed to be cleaner and easier to handle. The tough sheath will withstand much handling and abuse, the manufacturer states, and the cable is easy to pull. UL approved.

Victor No. 9 Pintypes undergoing routine electrical flashover, visual inspection, and final check for pinhole thread accuracy.

PINTYPE INSULATORS

VICTOR NO. 9
LOW VOLTAGE
PINTYPE

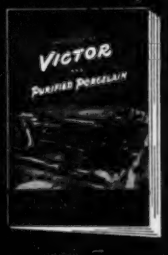
1. ROUTINE ELECTRICAL FLASHOVER
   Every Victor pintype undergoes a routine electrical flashover test before shipment to insure trouble-free service.

2. ACCURATE PINHOLE GAGING
   Every lot of Victor Pintypes must be able to pass the standard NEMA test for pinhole thread accuracy.

3. CAREFUL VISUAL INSPECTION
   The finished insulator is thoroughly inspected for general appearance with special attention to smoothness of conductor and tie-wire grooves.

These tests assure almost unheard-of uniformity of service . . . unequalled ease of installation of pintypes. These features, coupled with the greater hardness, strength and resistance to impact of Victor *Purified Porcelain*, make Victor Pintypes the power man's best buy.

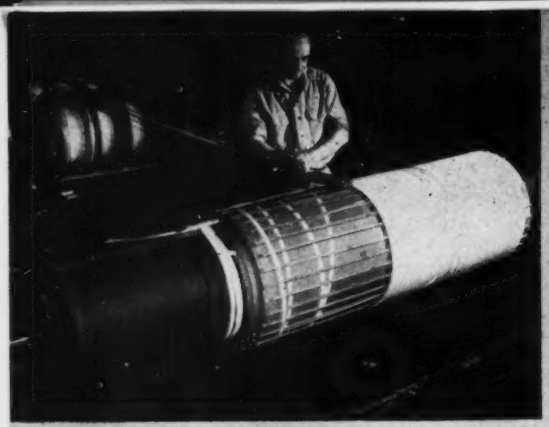
FREE BOOKLET gives you the full story on how Victor Insulators are made—how and why *Purified Porcelain* was developed. Write us for your copy.

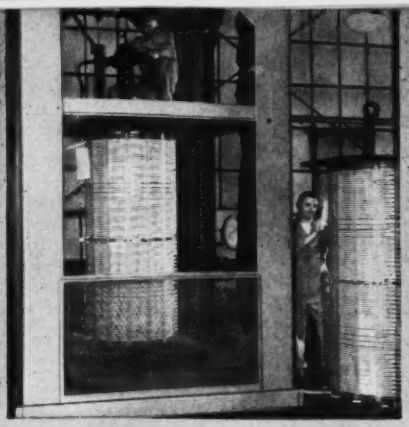


Specify

VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain





1 **LOW THERMAL GRADIENTS** and high insulation strength are assured by well-designed duct system which provides free circulation of insulating and cooling medium in the coil assembly of Allis-Chalmers power transformer.

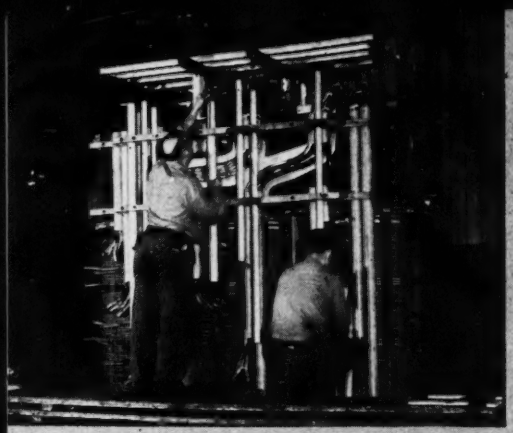
2 **PRE-COMPRESSED COIL STACKS** give added strength. Special press compresses high voltage coil stacks to exact dimensions to withstand the maximum short-circuit forces which may occur in service.

3 **PATENTED LOCKING ARRANGEMENT** keeps coils in perfect alignment after they are guided into place, holding them uniformly and permanently spaced with regard to insulation barriers and each other.

ALLIS-CHALMERS POWER Transformers

5 REASONS

Transformers



4 **EXPERIENCED ASSEMBLYMEN,** like those above, take extreme pride in their workmanship. The result is a transformer of high quality and excellent appearance. In the operation shown above, high insulation strength and excellent support of leads are being attained through use of machine wound tubes anchored by maple supports bolted to the side frames.

5 **MODERN TEST EQUIPMENT** checks transformer performance against design specifications after all manufacturing operations are complete. All tests are made in strict compliance with NEMA and ASA standards. As a result of all these special processes and necessary test equipment, you can expect the longest possible transformer life with minimum maintenance costs.

Last Longer

REAL COST of any equipment is the initial price *plus* the upkeep. When you buy a transformer, you want assurance in advance that its operating life will be as trouble-free as possible. That's where the five points shown above come in. They give you some of the reasons why you can count on Allis-Chalmers power transformers for dependability.

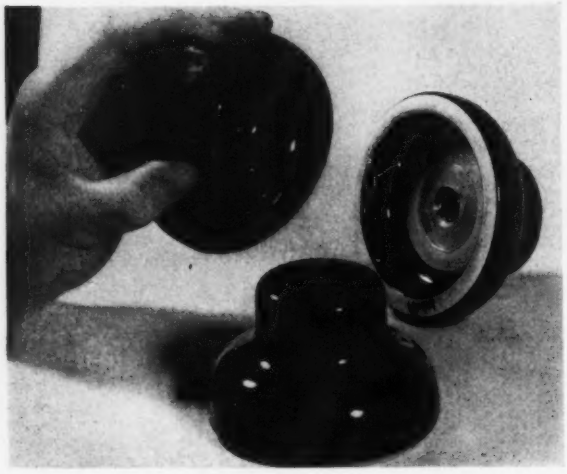
For more than half a century, Allis-Chalmers has been developing the special equipment and processes as well as a seasoned team of craftsmen for building transformers that provide maximum reliability through many long years of service. All this adds up to assurance that with an Allis-Chalmers power transformer on your system, you will be able to hold upkeep costs to a minimum.

These unique devices and special processes are just a few of the reasons it will pay to investigate Allis-Chalmers design and construction when you consider your next power transformer. A-4071

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Milwaukee 1, Wisconsin



Bolt-End Insulators

(4) Lapp Insulator Co. Inc., Le Roy, N. Y.

This bolt-end insulator, which shields the projecting ends of transformer support bolts, is designed to protect workers who may not realize that through bolts supporting grounded transformer housings are at ground potential. The insulator consists of a porcelain shape, chocolate glazed, with a recess in the center of which is a metal thimble, with a ⅝ in.—11 thread.

Front-Operated Safety Switch

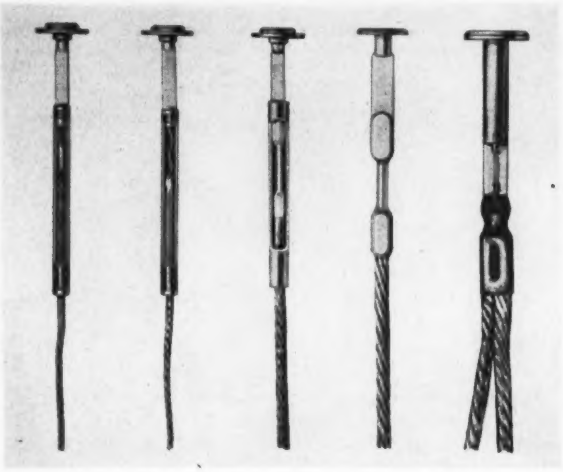
(5) Federal Electric Products Co., 50 Paris St., Newark 5, N. J.

A 200-amp front-operated safety switch with visible blades has been added to the manufacturer's line, which already includes this type unit in 30, 60 and 100 amp. The line is for use in 250- and 600-v lines.

Main features of the new industrial switch are its front operation, permitting recessing or close ganging batteries of switches, and an oversize handle that indicates on and off positions from a distance. Another feature is the design of the fuse holder, with pressure spring located under the fuse where it is unaffected by its heat. High-pressure lever gives minimum contact resistance, according to the manufacturer.

For cool operation, there are only two joints to each pole, both under heavy pressure from external steel springs to hold contact resistance to a minimum, the manufacturer states.

Safety features listed are an insulated crossbar fitted underneath the blades so that the switch cannot fail to open when handle is thrown to off position; newly designed arc mufflers on 250-v switches and patented Rolarc arc snuffers on switches over 250 v.



Fuse Links

(6) Line Material Co., Milwaukee 1, Wis.

A line of links meeting the new EEI-NEMA standards is electrically and mechanically interchangeable with other makes of standard fuse links. Two speeds are included, K (fast) and T (slow), with time-current characteristics to meet all major operating requirements, the manufacturer states.

These fuse links come in ratings from 1 through 200 amp, with two different fusible section constructions, die cast and wire type. The die cast tin fusible element on links 20 through 100 amp is patented. It is claimed to provide for a link that eliminates the human element in assembly and gives extremely accurate and consistent time-current characteristics.

Links from 6 to 20 amp are constructed with a hard-drawn, pure tin wire fusible element, which lends itself more readily to links with small diameter fusible elements.

On links above 100 amp, the fusible element is lap soldered to the shank and ferrule and the strain wire is securely fastened to relieve all tension on the fusible section. A fiber protector tube is used on all links below 50 amp.

The button and shank of these links is a one-piece forging, which contributes to low temperature operation. All buttons and shanks are tin coated to prevent corrosion and to insure good contact surface.

The links come in individual 3-, 4- and 5-cell containers.

Fill in the Coupon on Page 66

NEW

No. 53-XPJ Nicopress Tool with *Three Grooves*

Accommodates Nicopress Sleeves

FOR COPPER

1 solid, 1 seven strand, 2 solid, 2 seven strand, 2 three strand, 3 solid, 4 solid, 4 seven strand, 4 three strand, 6 solid, 6 seven strand, 8 solid, 8 seven strand, 3 No. 10, 3 No. 8.

FOR COPPERWELD

4A, 6A, 8A, 6C, 8C, 6D, 8D, 9½D, 3 No. 10, 3 No. 12, 4 solid, 6 solid, 8 solid, 10 solid.

FOR ALL-ALUMINUM

2 solid, 2 seven strand, 4 solid, 4 seven strand, 6 solid, 6 seven strand, 8 solid.

FOR AMERDUCTOR

8SCP or SCG, 10SCP or SCG, 12SCP or SCG.

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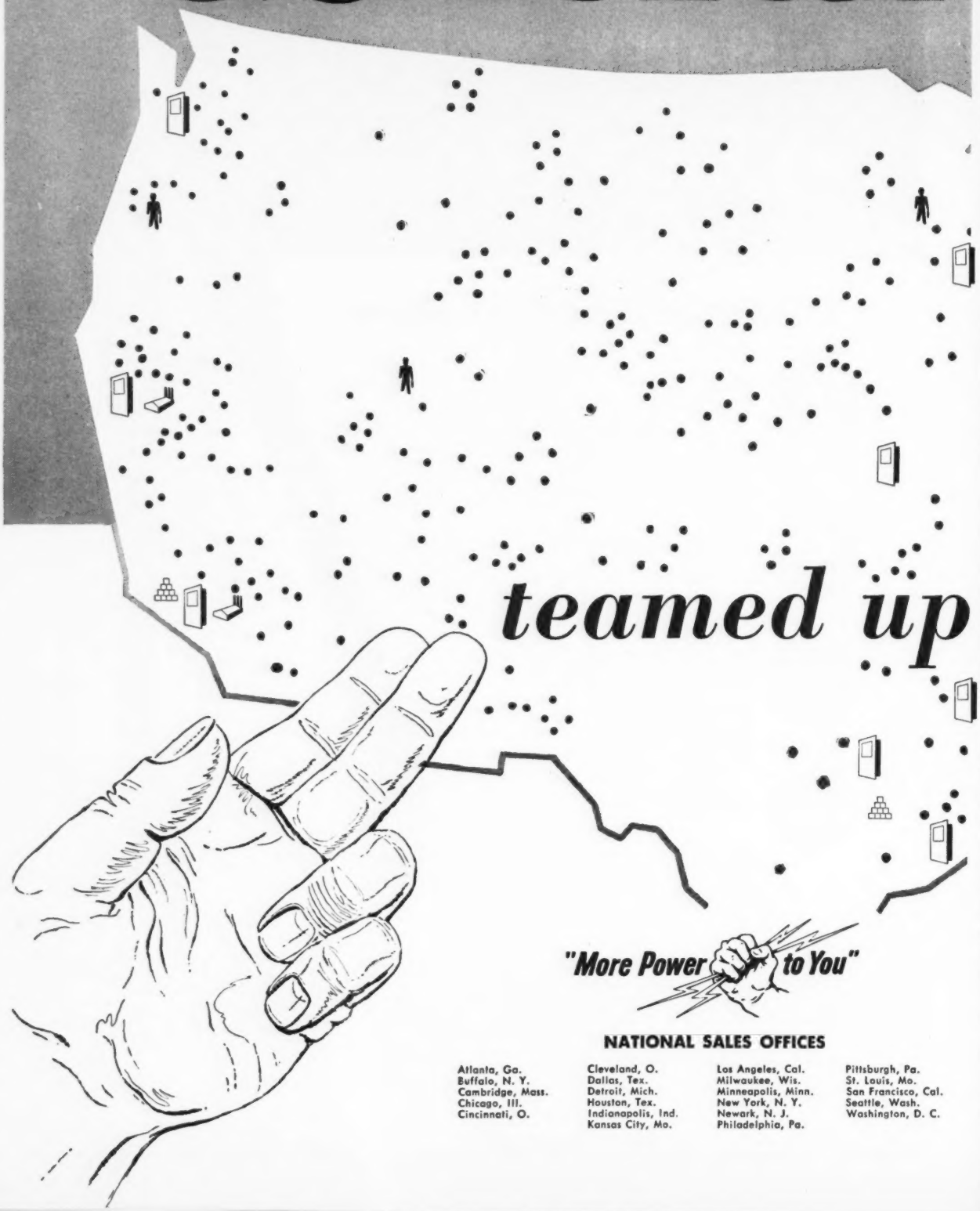
General



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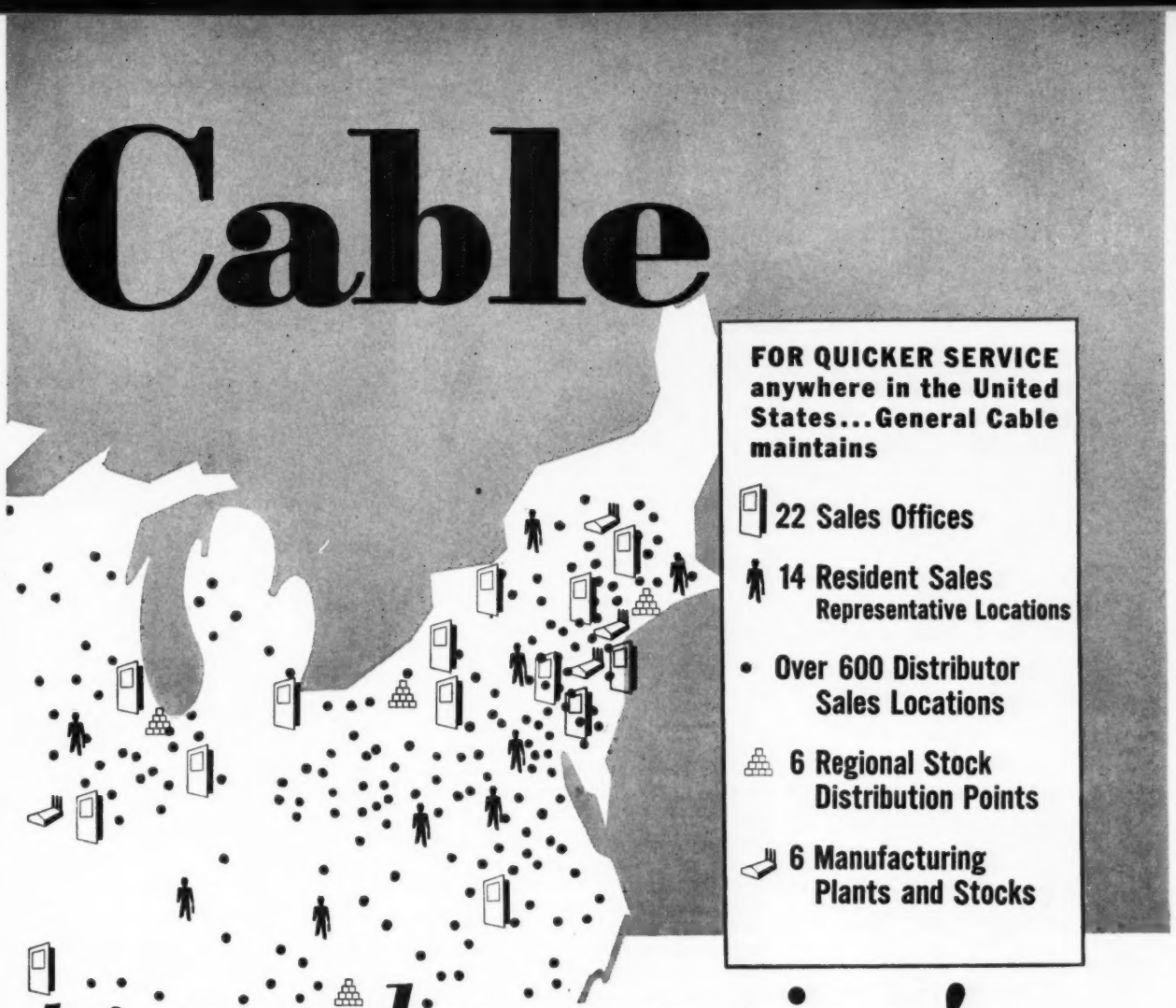
Cable



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Appleton Industrial Lighting Equipment is precision-designed to provide *good light*—the right light, without uncomfortable glare, troublesome contrast or shadow. Expert engineering, unequalled manufacturing facilities and a half century of experience are combined in each Appleton fixture to provide maximum efficiency at minimum installation, service and operating expense.

Appleton Lighting Fixtures are made to suit every industrial requirement—including hazardous locations—whether indoors or out. For the finest illuminating equipment or expert assistance on any lighting problem, contact Appleton—Standard for Better Lighting.

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CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

Carbon Brush

(7) Helwig Carbon Products Co., 2540 N. 30th St., Milwaukee, Wis.

In the Multiflex improved carbon brush a neoprene pad holds multiple brush units together in a design claimed to give better contact, reduced vibration and reduced circulating current. These brushes are tailor made for every motor or generator from fractional horsepower to the largest size, the manufacturer states.

Light Bulb Changer

(8) J. B. Sebrell Corp., 300 S. Los Angeles St., Los Angeles 13, Calif.

Light bulbs can be removed from the floor with these changers, which are used in conjunction with lightweight aluminum sectional poles. Desired length of pole is built by inserting the unexpended end of one pole into the expended end of another. Attachments for various size bulbs from 15 to 1,500 w are attached to the end.

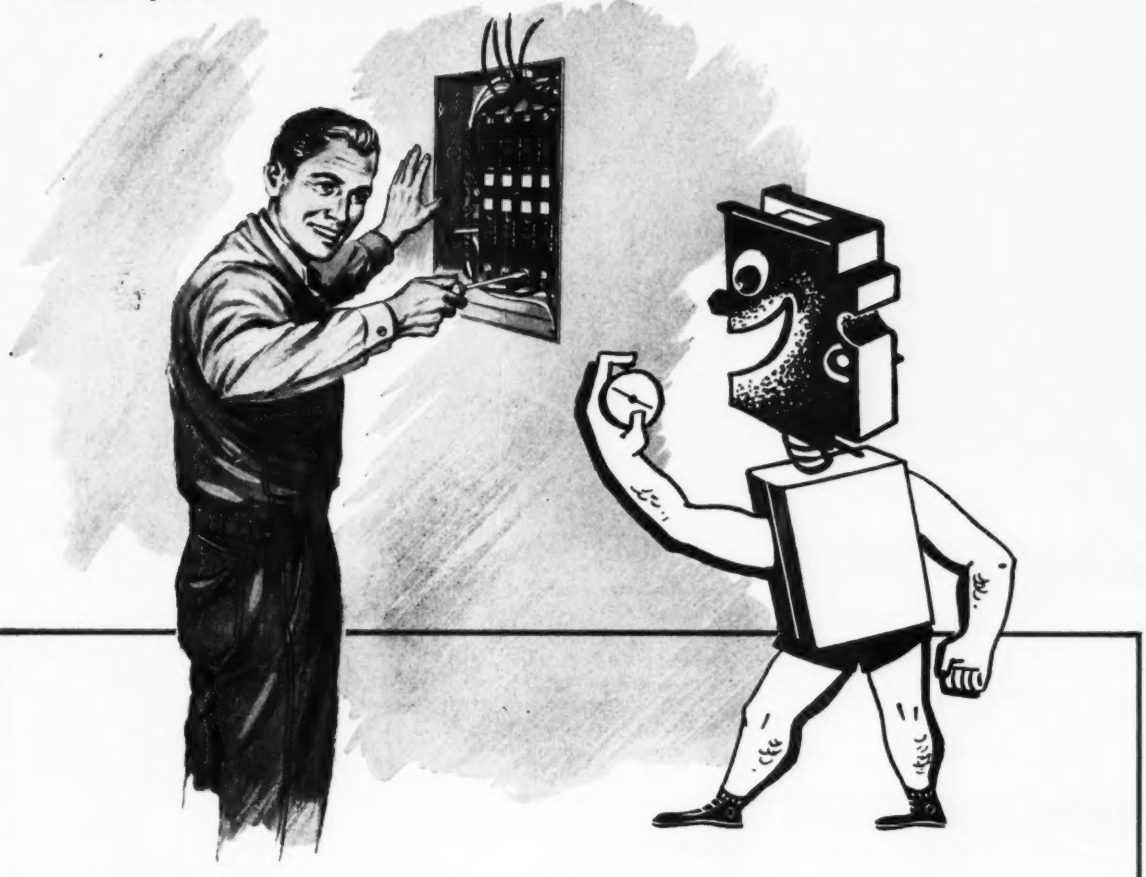
An angle adjustment is available, as is a broken light bulb remover that fits both standard and mogul lamp bases. An insulated 5-ft pole section is offered for use with regular sections of aluminum pole.

(9) ADJUSTABLE-SPEED DRIVE—An all-electric adjustable-speed drive of from ¾ to 3 hp has been announced by the Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio. This electronic-type drive is designed for production jobs and processing operations having these relatively low horsepower requirements.

(10) INTERCOMMUNICATION—Two moderately priced series of intercommunication units have been added to Webster Electric Co.'s Teletalk line. The 1000 and 1100 series permit instant two-way natural voice conversations between rooms, departments or buildings, the manufacturer states. Details from Webster Electric, 1900 Clark St., Racine, Wis.

The contractor thought it was silly...

*till he proved to himself the **Stab-lok**® system costs least to install*



REPORT OF INTERVIEW WITH CONTRACTOR:

Q—We understand you compared the time to install different circuit breakers. What was the result?

A—It wasn't even close! Stab-lok was way out ahead. Stab-lok is so much quicker to install that it cuts labor costs way below other systems.

Q—What are the special features that speed up Stab-lok installation?

A—Well, first, Stab-lok plug-in type individual pole breakers provide the quickest method of securely connecting breakers to busses. Second, Stab-lok's solderless lugs give you today's simplest and fastest form of connection. Then, too, Stab-lok's lug type neutral saves the bother of wire looping... and removable main lugs, in the larger devices, save time when installing main conductors.

* * *

Besides these four features, there are still others that make Stab-lok least costly to install... easily removable interiors... large gutter space... conveniently located knockouts... simplest adjustment to plaster level on flush enclosures.

In addition, Stab-lok is the most modern, complete and flexible circuit protection system on the market. Write for full information, and order Stab-loks from your distributor. Federal Electric Products Company, 50 Paris Street, Newark 5, N. J.

Federal Noark products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

FEDERAL NOARK®

Federal NOARK

Rely on Quality—

PYLE-NATIONAL INDUSTRIAL LIGHTING FIXTURES

for safety

IN HAZARDOUS LOCATIONS

EXPLOSION PROOF

Pyle-National LE Series: Class I, C and D

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

DUST-TIGHT

Pyle-National DE Series: **Class II, Groups, E, F and G**

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

Consult the new PYLET Catalog for complete line of explosion-proof supporting PYLETS for lighting fixture mounting.

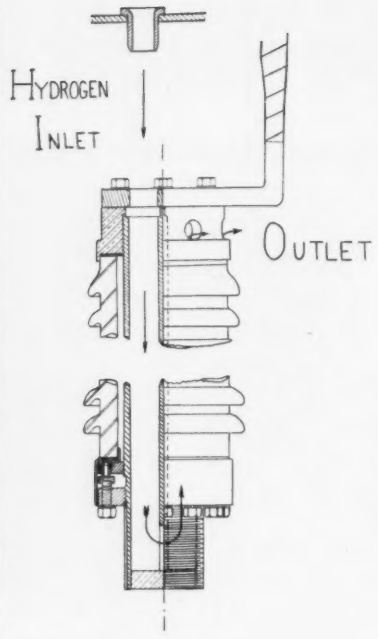
SINCE 1897

THE PYLE-NATIONAL COMPANY

1364 N. KOSTNER AVENUE CHICAGO 51, ILLINOIS

District Offices and Representatives in Principal Cities of the United States.

PLUGS AND RECEPTACLES • FLOODLIGHTS • CONDUIT FITTINGS



Jet-Cooled Bushings

(11) Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

A new jet-cooling method of terminal bushing ventilation for the manufacturer's hydrogen-cooled steam turbine generators is said to increase the current capacity of conventional bushings nearly four to one without sacrificing compactness and sturdiness of conductor and bushing design.

To meet demands created by increased ratings being built into generators, the manufacturer points out, multiple bushings have been used in some instances to keep temperatures within safe limits at high amperage and other machines have been built with bushings of 6,000 amp capacity and larger.

The new jet-cooled terminal bushing utilizes the cooling capabilities of high-velocity hydrogen gas in much the same way as does supercharging of generator conductors, it is stated. The terminal conductor is a hollow copper stud, divided into inlet and outlet passages by a vertical partition. A jet of cool hydrogen, forced at high velocity from the generator pressure chamber, is directed through a hole in the top of the bushing. It travels through the passages in direct contact with conductor copper and exhausts into the fan suction region of the generator by means of radial openings in the bushing cap.

According to the manufacturer, tests indicate that with jet cooling a 4,500-amp bushing can safely carry 17,500 amp with hydrogen pressure at 30 psig. Even at 0.5 psig hydrogen, the bushing will carry well over 10,000 amp, it is claimed.

The manufacturer points out that, while this development in generator design parallels advances in supercharged cooling, it is equally applicable to nonsupercharged hydrogen-cooled machines operating at normal pressures.

Wireways

(12) Keystone Mfg. Co., 23328 Sherwood Ave., Center Line, Mich.

Eight-inch square wireways will carry up to 15 500-CMF conductors; are available in two types, flanged hinged cover and flangeless screw cover.

Auxiliary fittings for the hinged cover include 90° elbow and pull boxes, T fittings, closing plates, trough collars and bracket and drop hangers.

The flangeless screw cover wireway is designed for use with meter boards, service boards, loadside switches, etc., and its auxiliary fittings include closing plates and U connectors.

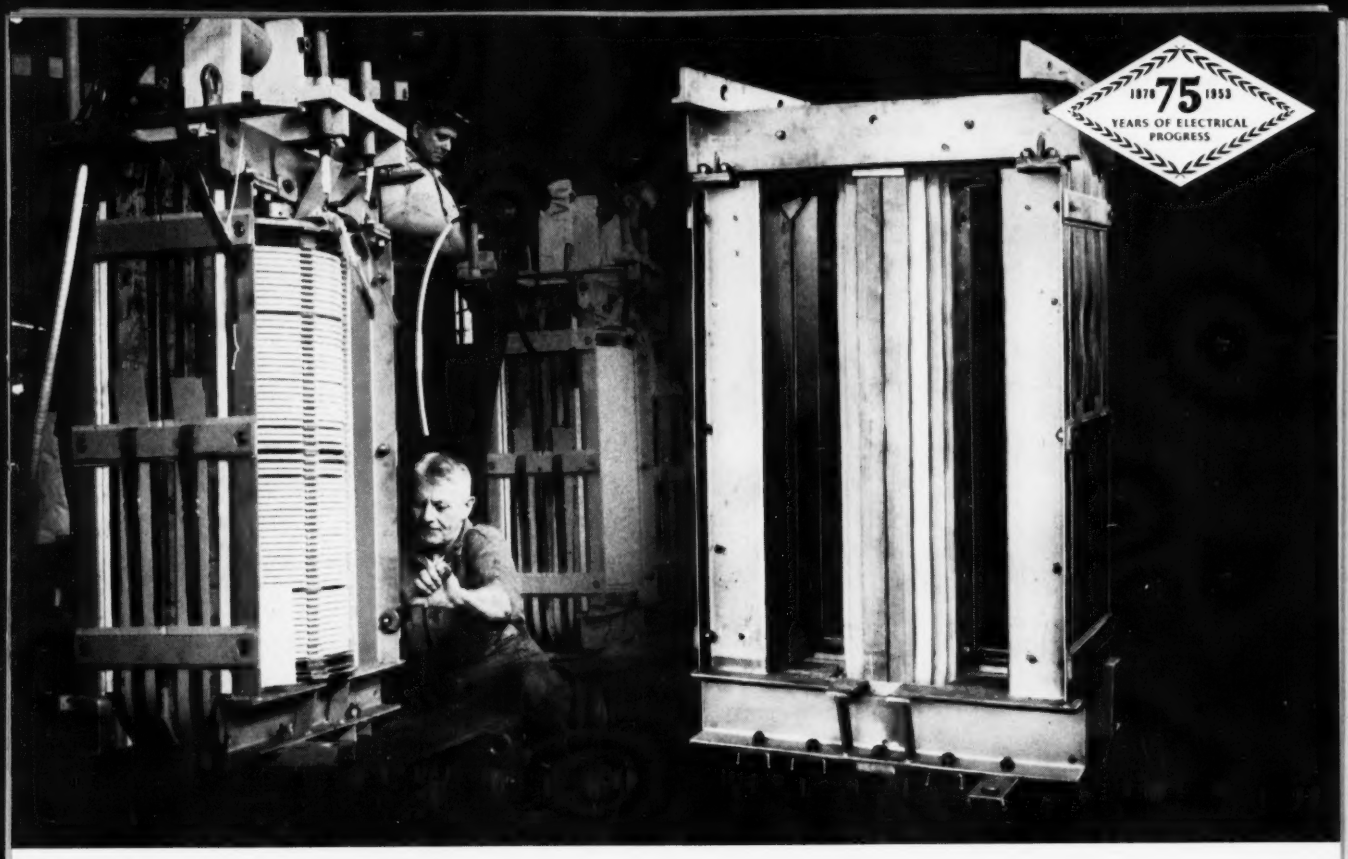
Both types come in 1, 2, 3, 4 and 5 ft lengths and have knockouts in side and back to accommodate ½-, ¾-, 1- and 1¼-in. conduit. They are also available without knockouts.

Flush Switch Cover

(13) Killark Electric Mfg. Co., Vandeventer & Easton Ave., St. Louis, Mo.

This flush switch screw cap weatherproof receptacle cover is supplied with mounting screws and gasket. An addition to the manufacturer's line of spring-type FSLC covers, this unit is also made of an aluminum alloy that is nonsparking, nonrusting and noncorroding.

Fill in the Coupon on Page 66



New core design, developed by G-E engineers, reduces size and weight . . . improves performance of small power transformers

SMALL POWER UNITS NOW OFFER ADVANTAGES PIONEERED IN SPIRAKORE* DISTRIBUTION TRANSFORMERS

The most favorable losses, exciting currents, weights and dimensions of power transformers—all important to electric utilities—are obtained when the electrical advantages of grain-oriented cold-rolled core steel can be fully utilized.

This steel, known as Corisil, was developed in 1937 by General Electric in co-operation with Allegheny Ludlum Steel Corporation. First used in G-E Spirakore distribution transformers, it resulted in vastly improved performance characteristics and reduced size and weight. Since then our engineers have worked to develop new core designs that would provide these same benefits for power transformers.

Cold-rolled steel inherently provides two controllable characteristics of importance to both the transformer designer and user. These are directional properties and strain sensitivity.

Directional properties are advantageous. Cold-rolled steel is produced in continuous strips. With certain processing, a large proportion of the crystals are oriented so that magnetizing flux flows most easily in the direction in which the steel was rolled. When a core is designed so that the flux passes through the laminations in this way, lowest losses are obtained and the least magnetizing force is required.

Both core loss and magnetizing current are increased by mechanical strain to a much greater degree in oriented cold-rolled steel than in conventional hot-rolled steel. Consequently, the best core structure is one that minimizes strain on the core laminations.

Wound core designs as used in distribution transformers reduce strain to a minimum and permit flux to flow in the laminations parallel to the direction of rolling. Wound cores, however, are impractical for power transformer cores due to the size, weight and mechanical requirements of the latter.

To meet these requirements, G-E engineers have produced the *precut, preformed* core . . . a new design which makes the many advantages of Spirakore distribution transformers available in small power transformers.

Registered trade-mark of General Electric Company

GENERAL ELECTRIC

For further details see next page

G-E Spirakore power transformers fully

LOWER AWAY—Low-voltage winding being placed on G-E Spirakore single-phase 3333-kva power transformer core. Supporting structures relieve annealed core of strain. When windings are in position, core ends are put back and upper clamping structure bolted in place.

utilize properties of grain-oriented steel

for smaller size, lower weight, improved performance

The Spirakore or preformed type of power transformer core is a low-strain, efficient magnetic circuit designed to take full advantage of the highly directional properties of cold-rolled, silicon steel. Completely new to power transformers, the preformed core provides the designer with greater flexibility than was ever possible with the conventional plate-type core. Weights and dimensions, losses, noise and exciting current can be controlled over a broader range to best meet a particular set of application requirements.

Improved operating characteristics of Spirakore power transformers result from the following:

1. Flux flows through the core laminations always in the direction of the grain thus reducing core loss and magnetizing current.
2. With only one joint per convolution, joint effects are almost negligible. Close-fitting construction reduces both losses and vibration in joint regions.
3. Laminations are not required to take lifting or short-circuit forces. Clamping structure cradles the core and transmits these forces so that no loss-producing strains are imposed on the core steel.
4. Flux distortion and harmonic generation which cause higher losses and noise in corner regions of plate-type cores are eliminated by the configuration of the preformed core.
5. Final anneal, after all piercing, shearing and forming operations, relieves strains and assures minimum losses in the completed core.

The preformed core is standard construction for General Electric single-phase power transformers rated 5000 kva and below. With the preformed core, losses, exciting current, noise level, weight and dimensions can be varied to best suit the conditions for your particular application.

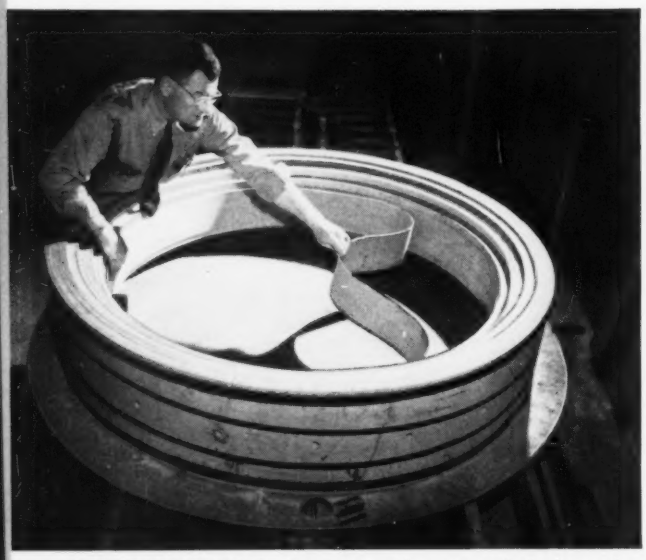
The Spirakore power transformer is another contribution from General Electric's continuing developmental program to give you more for your transformer dollar.

For more information on preformed cores, write to Section 421-11, General Electric Co., Schenectady 5, N Y.

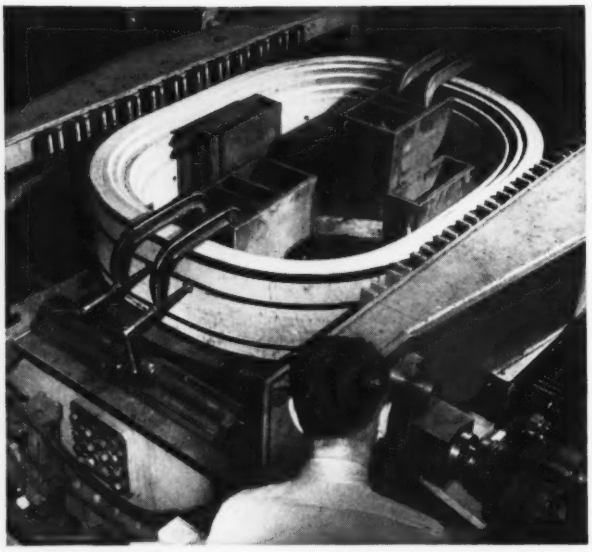
Progress in Power Transformers

GENERAL ELECTRIC

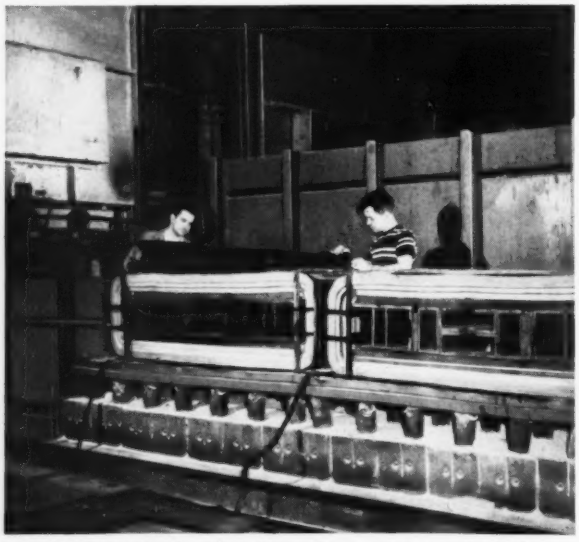
Flux flowing with grain in steel, no corner effect, small mechanical strain... features of G-E preformed core



1 COLD-ROLLED STEEL laminations, cut in progressively decreasing lengths by automatic shear, are shown stacked into a ring prior to final forming.



2 HYDRAULIC PRESS forms ring into rectangular section. Two sections are required to complete the core. Continuous strip eliminates corner effects of plate-type core.



3 FINAL ANNEAL after forming relieves strains to hold losses down. Coating applied to laminations as they leave the shear acts as an insulator to limit eddy currents during operation.

4 CLAMPING STRUCTURE cradles core, takes lifting and short-circuit forces—prevents strain after final anneal. Insulation between clamps and core permits single point grounding.

You can put your confidence in—

GENERAL ELECTRIC

CUT COSTS WITH GREENLEE TIMESAVING TOOLS FOR ELECTRICIANS

HYDRAULIC BENDERS FOR CONDUIT, PIPE

Quickly produce your own bends *right on the job*. With a GREENLEE Bender *one man* in but a few minutes makes smooth, accurate bends in pipe and conduit up to 5". Compact, portable . . . saves hours, saves materials.

HAND BENDERS FOR TUBING, PIPE, CONDUIT

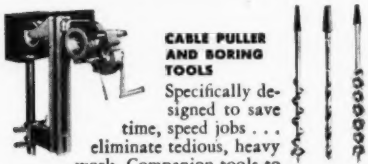
Quickly form small-radius bends without flattening or kinking. Especially designed to make neat bends for sharp corners, nooks and other close quarters. Saves up to 75% in time and materials on many jobs.

KNOCKOUT PUNCHES AND CUTTERS

For fast, easy enlarging of knockouts and cutting of holes in metal boxes, cabinets, panels. Various sizes and models for making openings for conduit sizes from ½" up to 3½". To operate, simply turn with a wrench.

HYDRAULIC KNOCKOUT PUNCH DRIVER

Portable hydraulic unit for driving GREENLEE Knockout Punches. Speeds jobs . . . easily operated. Develops over 11 tons of pressure so that conduit openings are cut in 10-gauge metal with ease.



CABLE PULLER AND BORING TOOLS

Specifically designed to save time, speed jobs . . . eliminate tedious, heavy work. Companion tools to many other GREENLEE timesavers for the electrician.

GREENLEE

Write for new Electrical Tool Folder, Greenlee Tool Co., 1767 Columbia Ave., Rockford, Ill.

Flush Enclosure

(14) Combustion Control Corp., 718 Beacon St., Boston 15, Mass.

Flush-type enclosures for the 26 series controls included in the Fireye Flame Safeguard systems FP-2 and FP-4 can be mounted in the combustion control power panel with all control wiring concealed in the rear. The FP-4 system is for manual or semiautomatic fired gas-oil or coal burners and the FP-2 is for fully automatic burners. Details in bulletin CP 519, manual and semiautomatic controls; bulletin CP 520, fully automatic controls.

Weatherproof Light

(15) Killark Electric Mfg. Co., Vandeventer & Easton Ave., St. Louis, Mo.

A new weatherproof lighting fixture is made of Alumalloy; has a weatherproof neoprene gasket seal that excludes dirt and vapors, the manufacturer states. The new series includes three styles, bracket, ceiling and pendent, in clear or frosted glass; will take from 60- to 150-w lamps; comes in plain Alumalloy or in steel grey finish.

(16) **INSULATION** — A fire-retardant laminated plastics insulation that is self-extinguishing in one minute or less has been announced by General Electric Co.'s Chemical Division, Pittsfield, Mass. Designated G-E 11542 Textolite laminate, the paper-base material was developed specifically for electronic components where fire hazards exist and the mechanical and insulating properties of laminates are needed.

(17) **POWER SUPPLY**—The Tesco meter testing power supply is designed to give a stable and controlled source of single-phase potential and single-phase current for general testing purposes, with means for adjusting the phase angle so that power may be supplied at any desired power factor, leading or lagging, according to its manufacturer, Eastern Specialty Co., Philadelphia 40, Pa. Details in bulletin 62.

(18) **FOOT SWITCH**—General Control Co., Boston 34, Mass., has introduced a new type MA foot switch. Its internal switching action has been improved and access to the internal du.op switch terminals has been facilitated; actuating treadle built into the top requires light foot pressure, the manufacturer states.

(19) **TESTER** — A device to test wiring and appliances with the power off is offered by Electro-Tester Co., Department C, 605 Broadway, Malden, Mass. It is a device with two wires that are singly connected to the circuits being tested. A small bulb lights automatically if there is no trouble.

(20) **POTENTIOMETERS** — Bulletin 68 plunger potentiometers are designed for industrial electronic control applications such as constant cutting speed machine tool drives, winder drives and processing machinery. Made by Ward Leonard Electric Co., Mount Vernon, N. Y.

MOTOR and GENERATOR BRUSHES ARE VOTED "LEAST LIKELY TO FAIL"

"OHIO" brushes have attained a fine reputation throughout industry since 1916 for their rugged dependability and smooth operation. We have designed and produced, "from raw material through to the finished product," thousands of types of brushes for thousands of clients for practically every type of application. The continuous patronage of our clients is ample testimony of our ability to serve you in the same manner from every standpoint of good business ethics. Up-to-date, illustrated literature on our products is immediately available to you.

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SHAWMUT'S NEW FORM 208 Amp-trap®

SAVES BOTH CIRCUIT AND CUSTOMER
(FOR 120/208 VOLT AC OR 125/250 VOLT DC NETWORKS)

POSITIVE PROTECTION AGAINST SUPERCURRENTS

Low voltage AC and DC networks give large utilities and their customers greater continuity of service and easy expansion of their systems. The only drawback to this type of network is the constant threat of danger from heavy short-circuit or fault currents. Shawmut's new FORM 208 Amp-trap eliminates this danger from these circuits. On actual test, its amazingly fast "chop-off" stops a short-circuit *even before it reaches the peak of its first ¼ cycle — even if the available peak current could reach* 560,000 *Amps!* It anticipates and prevents the destructive build-up of heavy fault currents so dangerous to office buildings, stores, hospitals, theatres, schools, etc. FORM 208 saves *both* circuit and customers.

USES & SPECIFICATIONS

Amp-trap FORM 208 is made for Entrance Switch Service, Underground Network Conductors, Distribution & Panelboards and other applications. It is built in Ampere ratings of 1000, 1200, 1600, 2000, 2500, 3000, 4000 and 5000 for Entrance Switch Service and for cable sizes from 4/0 to 1000 MCM. It runs "cool" and carries 100% of its rating with temperature rises less than those recommended in the Underwriters' Laboratories Standards for Fuses. The watt (power) loss is probably lower than for *any other over-current protective device.* Hence it may safely be installed in vaults and steel enclosures and subjected to long continued loads.

LOW IN COST — EASY TO INSTALL

FORM 208 Amp-traps clear fault currents long before they can burn or wreck bus bars and switch gear. Yet they are small in size, low in cost and easy to apply. They have a variety of mountings for flat, bus or tubular connectors. Adapters can be supplied for switch cubicles now equipped with copper or aluminum alloy links. FORM 208 is the "little brother" of the famous FORM 600 Amp-trap which has long been used so successfully on 600 volt circuits. Write today and find out about FORM 208 at once.

208
WITH TUBULAR TERMINALS

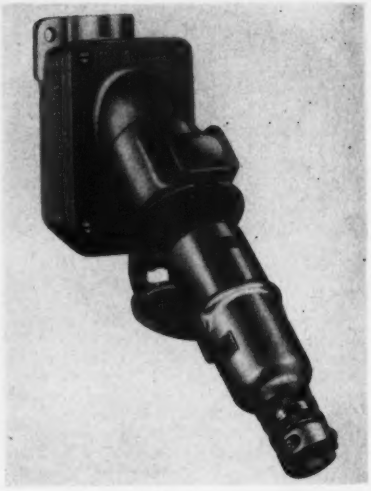
Copyright 1953 The Chase-Shawmut Co.

60 YEARS FROM EDISON TO ELECTRONICS

208 AMP-TRAP — "Awake At The Switch"

THE CHASE-SHAWMUT CO.

385 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS



Explosion-proof Connectors

(21) Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.

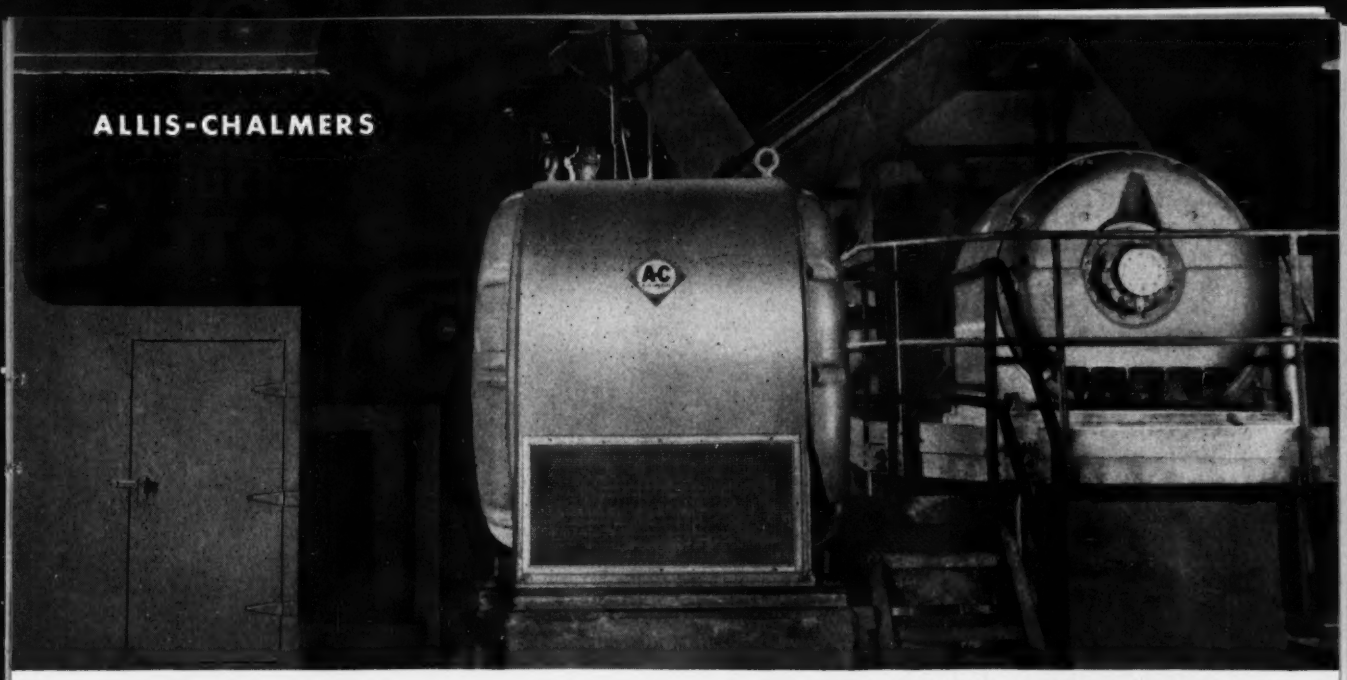
A new line of explosion-proof plugs and receptacles designated EPD and ERR is designed for portable electric equipment in Class 1, Group C and D hazardous locations. In addition, these connectors operate as current-rupturing devices. A delayed action lock makes it impossible to open or close the circuit except when the contacts are confined within the explosion-proof chamber, the manufacturer states. UL approved, these Strate-Line plugs and receptacles are designed for 15 and 30 amp, two wire, three pole and three wire, four pole. Details in bulletin 1105.

Limit Switch

(22) Micro Division, Minneapolis-Honeywell Regulator Co., Freeport, Ill.

A new explosion-proof heavy-duty precision limit switch is UL listed for hazardous locations of Class 1, Group C and D. Designated IMLI-EI, it is made so that the user can adjust the operating head to any of four horizontal positions. The roller arm assembly may be reversed to position the actuator roller on either side of the actuator arm. Roller arm is field adjusted to operate clockwise, counter clockwise or in both directions; assembly is adjustable through 360° to any of 870 positive-lock positions at intervals of 0.4°. Including adjustable head, the switch case is 6 in. high, 2 1/8 in. wide and 1 61/64 in. deep.

For More Data Fill in Coupon on Page 66



Left to right (above) are drip-proof, silicone insulated, 1000-hp, forced and induced-draft fan motors for unit No. 2. Forced draft fan motors for unit No. 3 will be of the weather-protected type for installation outdoors.

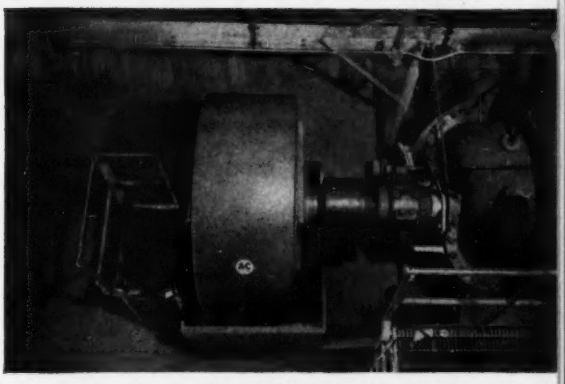
LET'S TAKE A LOOK AT TANNERS CREEK

One thing you're sure to notice at the Tanners Creek plant is that all the major auxiliaries for generating unit No. 2 are driven by Allis-Chalmers motors. Pictured here are a few of the larger ratings in this modern power plant of Indiana & Michigan Electric Company, a part of the American Gas and Electric system.

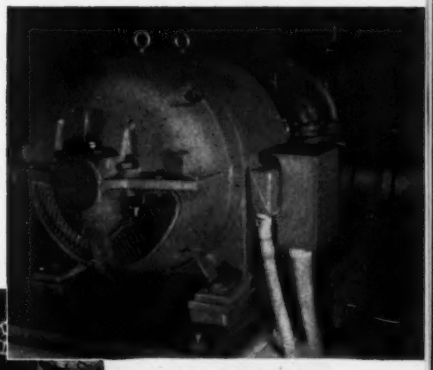
It's worthy of note that A-C is also building the motors for generating unit No. 3, scheduled for operation in 1954.

Allis-Chalmers builds a complete line of integral horsepower motors for power plant service, and your A-C representative can help you select the motors you need.

A-4084



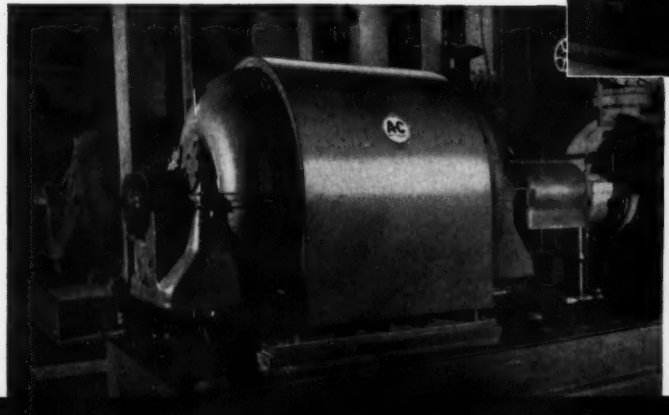
One of two 300-hp, 2300-volt, 218-rpm, drip-proof squirrel-cage motors driving circulating water pumps.



Rated 200 hp, 2300 volts, 1760 rpm, this drip-proof squirrel-cage motor driving an Allis-Chalmers screen wash pump is typical of the smaller ratings.

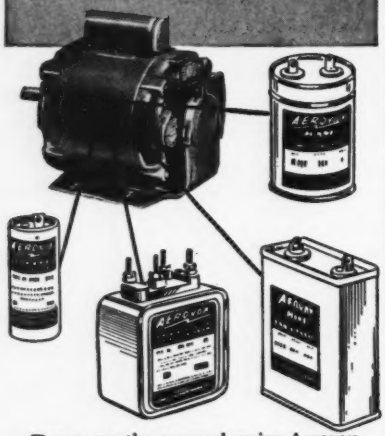
ALLIS-CHALMERS

Milwaukee 1, Wisconsin



These dependable boiler-feed pump motors are rated 2000 hp, 2300 volts, 3580 rpm each.

there's an
AEROVOX
AC Capacitor
for every
Capacitor Motor



REFER TO the comprehensive Aerovox listings. You'll immediately spot the correct capacitor replacement for any standard capacitor-start motor. It's a cinch!

Even when you can't identify the capacitor or motor type, it's still a cinch with the Aerovox Capacitor Selector which indicates proper capacitance value for quick and safe starts.

And if the motor must get going without delay, it's a cinch with the Aerovox Emergency Capacitor clipped in place. Provides any required capacitance value.

Best of all, it's a cinch to pick up the required exact-duplicate or universal motor capacitor at your Aerovox supplier.

DEALER AND JOBBER COOPERATION

Ask for catalog MS-517 at TRI-STATE. Complete factory stock of electrolytic and oil filled Aerovox Capacitors and Capacitor Selectors.

Available at TRI-STATE

One call for all
TOP BRANDS

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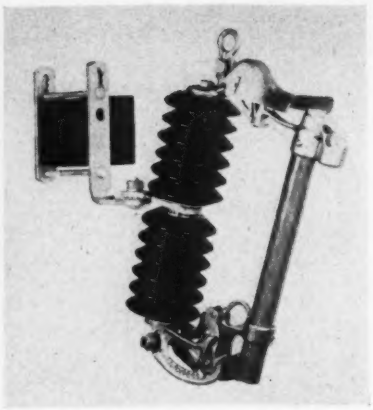


Control-Vented Cutout

(23) Southern States Equipment Corp., Hampton, Ga.

Type CV-33-D cutout features the principle of controlled venting that allows gases generated on heavy faults to escape at both ends of the fuse tube resulting in higher interrupting capacities. On moderate faults the expulsion gases vent at the lower end of the tube only. This cutout employs a universal button head fuse link; is available in 5, 7.5, 15 and 17 kv, in continuous current ratings of 100 and 200 amp and in interrupting ratings of 2,500 and 4,000 rms amp.

Safety Switches

(24) Trumbull Electric Department, General Electric Co., Plainville, Conn.

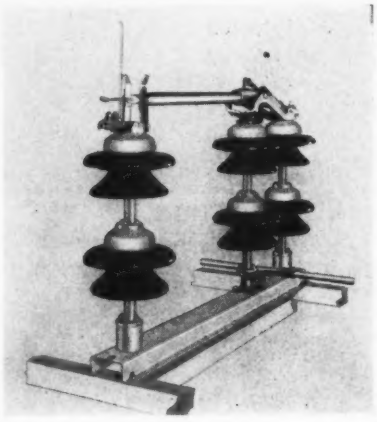
A new line of standard-duty safety switches is available in ratings of 30, 60, 100 and 200 amp, 240 and 600 v, two, three and four poles. According to the manufacturer, this switch, known as the Standard-Duty HCI, is designed to meet all but the most severe operating demands. It incorporates a pole unit, said to be in effect a self-contained switch and to have an arc-quenching action similar in principle to the arc-extinction features of modern circuit breakers.

The switch has quick-make quick-break action, interlocking cover and horsepower ratings. It meets NEMA type A standards and is UL listed.

Resin

(25) Dow Corning Corp., Midland, Mich.

A new air-drying or low-temperature baking silicone resin is hydrophobic in nature and designed for coating surfaces subject to voltage stresses to increase surface resistivity and minimize leakage currents, according to its manufacturer. XR-928 possesses the characteristic chemical inertness of the silicones, it is stated, and was developed for treatment of porcelain insulators on transmission and distribution systems. It can be used as a water repellent treatment for electronic equipment; can be blended with pentachlorphenol and might be used to make wood crossarms and poles water repellent and nonwicking, the manufacturer points out.



Switch

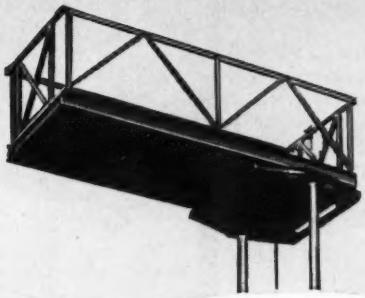
(26) A. B. Chance Co., Centralia, Mo.

This high-pressure rotating-stack switch, designated type H, has a hinge contact that never parts, according to its manufacturer. Feature is the hinged end of the blade, which is claimed to maintain high-pressure contact throughout the entire operating cycle. This contact gives little chance for corrosion or oxidation, it is stated, and the hinge contact is completely enclosed to further protect it from corrosive atmosphere and inclement weather.

The type H has only three moving parts and is designed for switching operations from 7.5 through 230 kv, 400 to 1,200 amp. It has very low radio and TV influence rating, it is claimed.

The switch blade rotates while opening and closing, cleaning the clip shoes and shattering heavy ice accumulations. Ribs on the switch clips lock the blade in position under heavy short circuits or surges. The weight of the blades on switches for 69 kv and above is counterbalanced by enclosed compression springs to make operation easy. The switch is operated by universal controls, adaptable to any type of structure whether mounted upright, vertically or underhung.

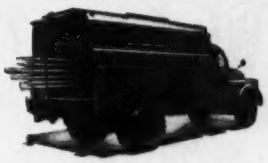
"The Accepted Standard with Utilities Everywhere"



Proved by many years of trouble-free service, *Powers-American* bodies set the pace as the number one choice with utilities everywhere ... the measurement of top quality and performance throughout the industry. "Job-engineering" steps up crew efficiency, lowers operating costs ... protects your investment. *Powers-American* has the type body and equipment to do your particular job most efficiently and at lowest cost.

HYDRAULIC TOWER

Platform extends to 30' above ground and can be revolved full 360°. Operation is controlled from truck cab or by workman on platform. Models are also available in ground-to-platform heights of 21' and 25' for installation on chassis having a rated capacity of 1½ tons or more.



LINE CONSTRUCTION BODY (600)

Available in 9' to 14' lengths, equipped to meet individual needs in any phase of utility work.

REVOLVING AERIAL LADDER

Models available in working heights of 23' 6", 26' 6", 30' 6", and 32' 6" for all styles of bodies.

LIGHT CONSTRUCTION BODY (SERIES 35)

Ideally suited for all types of light duty maintenance and construction work.

MAINTENANCE BODY (400)

Designed for medium duty general service. May be furnished with winch and derrick capable of handling 40' poles.

POWERS *American* DIVISION

AGB

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE-POWERS AUTO BODY COMPANY

MAIN OFFICE: 3900 North Broadway, St. Louis 15, Mo.

WESTERN OFFICE: 428 Latham Square Bldg., Oakland 12, Calif.

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

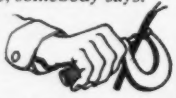
"What Is It?"

"What kind of [illegible]ankety-blank wire is this, anyway?

"We took this [illegible]il off a job some time ago, stuck [illegible]in the store room, and now we wa[illegible] to use it again.

"But is it hea[illegible] enough to carry the load?"

"Send it down to Engineering to have somebody figure the wire gauge, somebody says.



"Great. Gotta be miked. Gotta look up the current-carrying capacity in a handbook. Gotta get it delivered back to me. Very practical suggestion . . .

"And then, what kind of jacket has it got?

"I suppose now somebody is going to tell me to send it out to a chemical laboratory to get it analyzed.

"Not me. I'm going to sit right down and write . . .

Insulating Varnish

(27) Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington 11, N. J.

A high-heat-resistant insulating varnish, No. 180, is claimed to have undergone laboratory and preliminary field tests that indicate no adverse effects on numerous electrical applications when operated at temperatures up to 356 F. It has a clear color, excellent oil and moisture resistance, with a dry dielectric strength of 2,100 v per mil, the manufacturer states. A technical data sheet may be secured from the manufacturer's sales promotion department.

Voltmeter

(28) Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland 7, Calif.

The Touch Voltmeter indicates the presence of a voltage on a conductor when the conductor is touched with any part of the head of the test set. When touching the conductor the indicating meter will deflect, giving readings that are proportioned to the voltage. The voltage shown is the voltage to ground. Standard sets are for use on circuits of 20 kv maximum to ground.

The meter scale has four evenly spaced graduations of approximately 5,000 v per division. Indications should not be taken as exact voltage readings, the manufacturer points out, since the primary function of the device is to indicate whether the line, switchgear or other equipment is energized or dead.

The voltmeter comes in three types. One is slipped over a standard disconnect hot stick, one comes with stick permanently installed, the third is for use when the voltmeter is to be hooked over the line.

(29) **CROSS SECTION PAPER** — The Ogilvie Press, 691 Fulton St., Brooklyn 17, N. Y., is offering a cross section paper with ruling that will not reproduce. The paper comes 8x8 and 10x10 to the inch in 30-in.-wide rolls 20 and 50 yards and in sheets up to 24x36 in. in both a 100% rag treated vellum and a 100% rag natural bond tracing stock.

(30) **INSULATING TAPE** — A new annealed fiber glass tape is said to produce a finish that resists fraying, has a soft and supple "hand" and is free of foreign matter such as starches and lubricants. Made by Columbia Tape Mills Inc., East Greenville, Pa.

For More Data Fill in Coupon on Page 66

"No Question ABOUT TYPE OR SIZE"

The tough 60% *by weight* Neoprene protecting jacket on all

BRONCO 60 *Certified*

portable cords and cables is **BRANDED** with

THE NAME—BRONCO 60 NEOPRENE *CERTIFIED*...

THE TYPE—SO, W, G, or WELDING CABLE . . . .

NUMBER OF CONDUCTORS—1, 2, 3, 4, 5, 6, 7, 8 . . .

THE SIZE—18, 16, 14, 12, 10, 8, 6, 4, 2, 1, 1/0, 2/0, 3/0, or 4/0

VOLTAGE—300V, 600V, etc.

P116BM—approved number of the U.S. and Pennsylvania Bureau of Mines.

SELF-MEASURING!

The branding is repeated every two feet. Want 20 feet of cable? Count 10 BRONCO's and cut.

Furthermore, we brand BRONCO cords because we are proud of the way they perform. Years from now we want you to be able to identify the cord or cable that has delivered such outstanding continuous service.

WESTERN

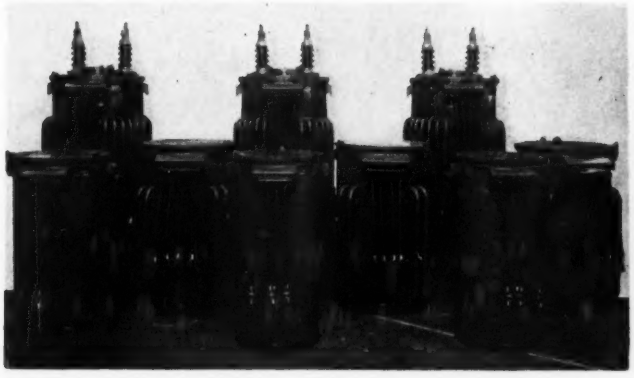
WESTERN INSULATED WIRE CO.

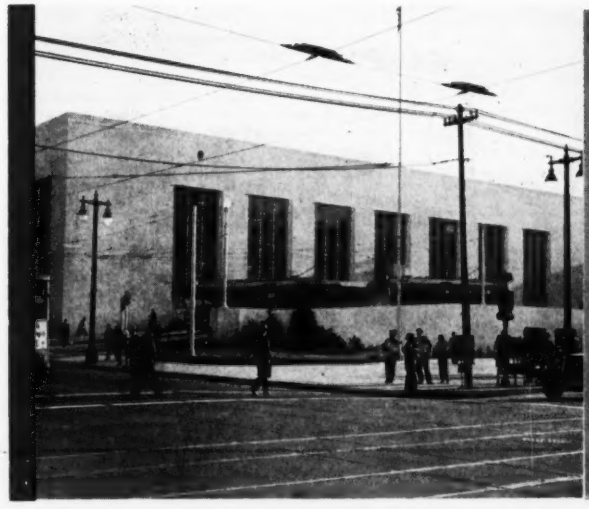
LOS ANGELES 58, CALIFORNIA

NINE LIVES

★

Special problems are welcome. Our experience is widespread and our production line is flexible. Write for information.





IT'S quite obvious these nine GARDNER transformers have them. But more importantly, every GARDNER transformer turns in so many years of dependable performance it seems each is blessed with the long life equal to that of the proverbial cat. And it's because GARDNER transformers have quality and longevity built into them. These nine GARDNER transformers were installed in the San Francisco-Oakland Bay Bridge Transit Terminal in San Francisco early in 1939, and have been in operation since.

GARDNER ELECTRIC MANUFACTURING COMPANY

FACTORY AND GENERAL OFFICE

4227 HOLLIS STREET EMERYVILLE (OAKLAND) 8, CALIFORNIA

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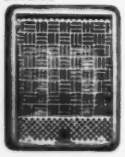
JOBBERS!

- EXTRA SALES
- ADDED PROFITS

Modern Automatic heating at its finest..

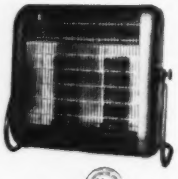
- Offer your dealers these outstanding products ... outstanding because their consumer acceptance has been rapid and sales have jumped by leaps-and-bounds.



MEIER

Nu-air

thermostatic-controlled automatic wall furnaces in 5 sizes to meet every requirement.



MEIER

Nu-air

thermostatic-controlled automatic portable floor furnaces permit you to direct heat where it is needed.

Manufactured by

MEIER ELECTRIC & MACHINE CO., INC.

Indianapolis 7, Indiana

Famed for Dependability Throughout the World

TO: The O. B. Wilt Co.

Western Representative

1355 MARKET STREET

SAN FRANCISCO, CALIFORNIA

Please send me additional information on the Meier Nu-Air portable and wall-type automatic wall furnaces, and the availability of franchises in my trading area.

My Name:.....

My Company:.....

My Address:.....

.....

BULLETINS ETC.

(31) HOME WIRING—A 32-page reprint of six articles on planning home wiring is available from Westinghouse Electric Corp. Originally published in "Practical Builder," the articles lay stress on need for adequate wiring, tell how the builder can include it in his homes. It is designated reprint 4912, may be secured from Better Homes Bureau, Westinghouse Electric Corp., 401 Liberty Ave., Box 868, Pittsburgh 30, Pa.

(32) HEATERS—Wall-type and portable electric heaters in designs and capacities for various rooms are listed in a catalog offered by Electromode Corp., Rochester 3, N.Y. It is designated Form EC-140.

(33) CATALOG SECTION—Anaconda Wire & Cable Co., 25 Broadway, New York 4, N.Y., has issued section 14 to its general catalog, dealing with accessories, unit packages of splicing material and allied products.

(34) GROUNDING SWITCH — Pacific Electric Mfg. Corp., 5815 Third St., San Francisco 24, Calif., is offering catalog sheet 158 on its type FG high-speed grounding switch.

(35) PENDENT LUMINAIRES—A 2-color booklet on pendent-type luminaires for street lighting has been published by General Electric Co., Schenectady 5, N.Y. This bulletin GEC-936 describes design, construction, performance, applications.

(36) WIRING DEVICES—Rodale Mfg. Co., Emmaus, Pa., has issued its 1953 catalog of electrical wiring devices and Turn-Tyte interlocking devices. Copies may be secured from the manufacturer's Catalog Department.

(37) RURAL SUBSTATIONS — Substations for rural distribution systems are covered in booklet 11B7895 from Allis-Chalmers Mfg. Co., 939 S. 70th St., Milwaukee, Wis. Two basic types of substations are offered by the manufacturer for light load areas: the strung-bus station for use where two or more three-phase feeders are required and the single-structure station for use where one or two three-phase feeders are required.

(38) FAN CATALOG—Attic and window ventilating fans made by Murray Co. of Texas Inc. are listed in a new catalog available from its sales company, The H. C. Biglin Co., 177 Harris St., N.W., Atlanta, Ga.

(39) CONTROLS — A new catalog of control instruments for furnaces, ovens, dryers, etc., has been published by The Bristol Co., Waterbury 20, Conn.; is listed as P1255.

(40) HARD HAT—Shorty, a safety cap that weighs 10 oz. and is claimed to have 40 ft/lb impact resistance, is described in a data sheet from E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif.

(41) CARTOON MANUAL—How to make good connections with aluminum conductor is the subject of a 20-page booklet published by Kaiser Aluminum & Chemical Sales Inc., 1924 Broadway, Oakland 12, Calif. Cartoons are used to simplify and emphasize five rules for making proper connections, including aluminum to copper. The booklet was designed as an education and training aid, the manufacturer states, and is available in quantity if desired.

(42) VOLTMETER — Its Wemco phasing voltmeter is described in data sheet 253 from Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland 7, Calif.

(43) TRANSFORMER CORES—A 16-page illustrated booklet on type C Hipersil cores for specialty transformers is available from Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. It is designated B-5402.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after September 1

Please send me, without obligation, the new product information or catalogs described on the following pages and identified by numbers circled below:

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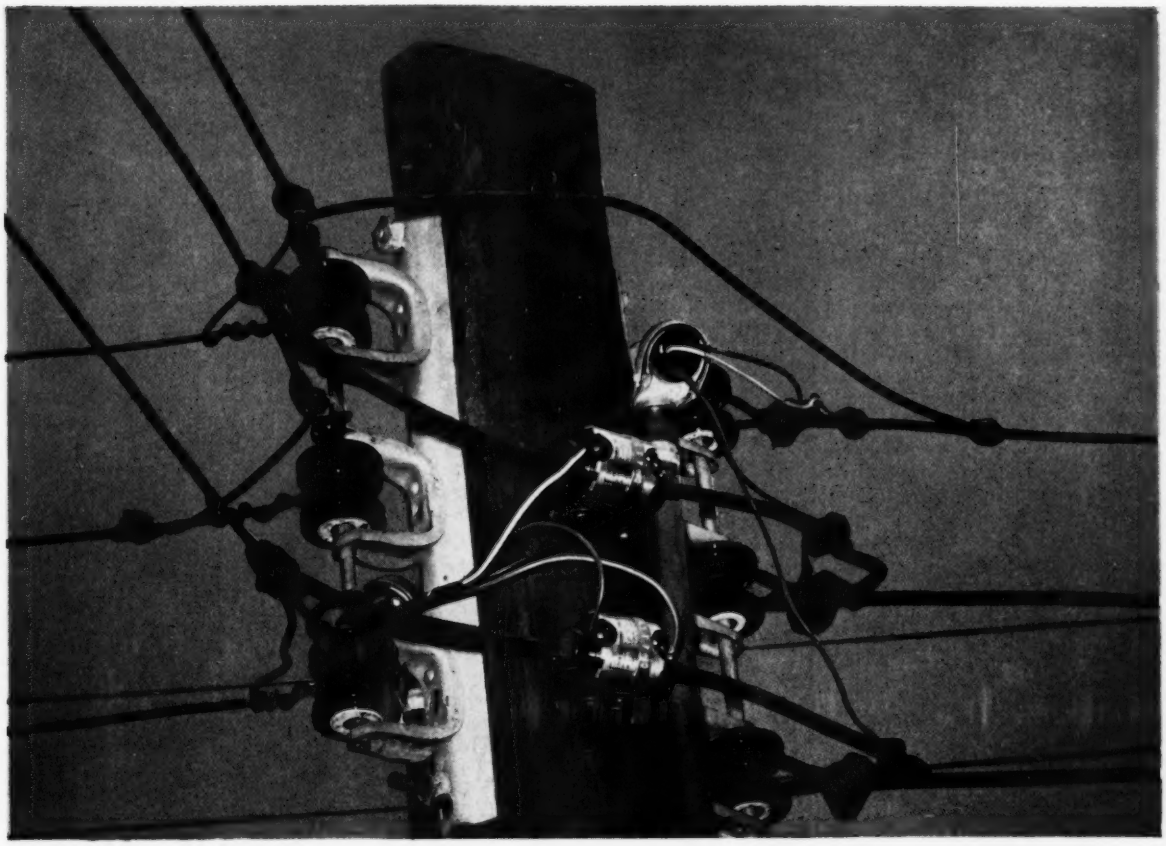
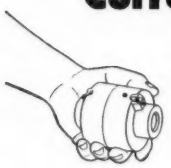
*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.



CUT INSTALLATION COSTS

with the *new* SANGAMO Type R Current Transformers



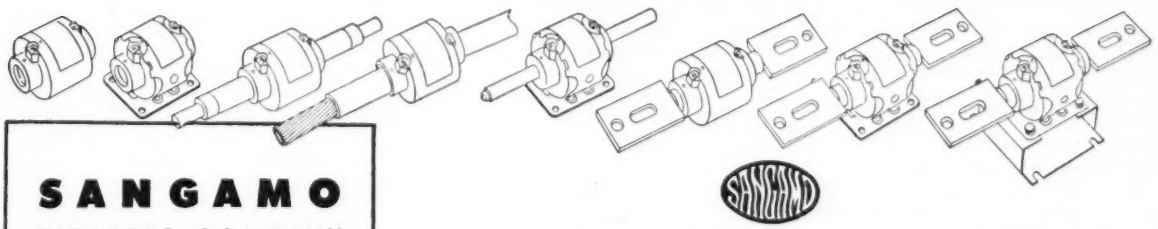
Eight variations of ONE basic transformer permit almost *any* primary arrangement.

New time and money saving installation methods are now made possible by the small size and light weight of Sangamo Type R Current Transformers.

In the installation shown above, made by a southern utility company, the base of the transformer is mounted to the pole. However, this rugged transformer is light enough so that it can also be mounted without the base by merely supporting it by the cable. Another saving is enabled by wiring secondary leads in the shop, with subsequent reduction in field installation time.

Type R Transformers are encased in a high impact phenolic shell filled with a thermo-setting plastic that eliminates voids and prevents moisture from reaching the core windings. The large opening in the Type RC-6 Transformer will admit a 250 MCM weatherproof cable in the 200 ampere rating, and 500 MCM weatherproof in the 400 ampere.

Full information is given in Bulletin 501. Be sure to get your copy.



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

SM53-5

ELECTRA'S HUSBAND

HOW MUCH WORK FOR A DOLLAR?

"HOW much work do we actually get for a dollar?" Electra asked in that practical way of hers that ignores some of the facts of economic life these days. She still thinks money ought to buy something, although when it applies to hats I sometimes wonder.

"Darn little, if you ask me," I retorted.

"Well that's just what I am asking," she persisted. "We need some remodeling done around here and I got to wondering how much actual work we'd get for our dollar."

"The answer is the same—darn little," I was reading the paper.

"With all this health and welfare and vacations and holidays and stuff, it just occurred to me that all we are doing is buying a lot of social security for somebody and getting very little work done in exchange," she persisted. Smart girl!

Well that touched me off too. "You've got something there. Let's figure it out for a minute. Let's take the electricians for instance. I happen to know what their scale is and also about all the fringes sewed on in recent negotiations. Also I know a bit about the contractor's overhead that has to be taken out of the dollar too, because the poor guy still has to keep books on it, handle the selling, collecting and supplies and a dozen other things necessary to keeping his place open and available to us when we need it. So let's look at the electrical dollar and see what it buys today."

To be brutally frank, it doesn't look at all good when you think of it that way. No wonder it costs a hundred dollars or so to install an electric range. You aren't buying much wiring. You are buying so much social welfare. Also so much monkey business, which goes by the better sounding title of "overhead," or nonproductive labor, paper work, permits, tributes or fees, traffic tie-ups and goodness knows what else.

First there's the new scale for electrical workers. It went up from $3 an hour to $3.19½, the highest in all the building trades—and don't think that doesn't make them all mad and eager to up their own to match the de luxe electricians!

That scale doesn't buy $3.19½ worth of work. Of it 7½c is for health and welfare. Then 4% or 12c is for a vacation. From here on it gets complicated. For it works backwards from the amount we have to pay by the hour for that man's time.

The contractor has to pay out about 10% for compensation and liability; 1% for the man's pension fund; another 1% or more for association dues. Besides he has to pay for a half hour of the man's time for cleaning up, another half hour or more of lost time for coffee or other interruptions. The time taken to get to the job and back also has to be paid now, either as time or travel expense. In some cases the contractor even has to pay for lost tool insurance for the man.

"Naturally, break this all down on the basis of a dollar that we pay for work and it whittles down to very little. The contractor has to charge us about $5.25 an hour or he'll lose money. That means we get 10 minutes work for a dollar, if we are lucky to get a good workman," I estimated.

"Well, let's just skip it," decided Electra. "You just bring home some of that cord from the five-and-dime store and put in those outlets I want. We're certainly not going to support the electricians in all that welfare for so little work. Ten minutes for a dollar! It's ridiculous."

When a woman says "it is ridiculous" in that firm decisiveness there is no arguing. We, like most everyone else nowadays, will do our own wiring to get by. If I don't, Electra will. There are so many little gadgets to make it easy these days.

Sad part of this whole thing to me is that the electrician himself gets so little out of this hike in the cost of his services. Out of his high wage he has to turn over to Internal Revenue and state some 25% of his wages. With such a rate he is up in the $6,000 a year class if he works steady. He gets hit both for income and surtax. Then he pays union dues and his percentage of the pension fund.

Without being aware of it he has also contributed to a new jump in the cost of living for everybody, including himself. And he has made it harder to sell his services, and hence reduced his market for work, once the big government jobs slow down. He has priced himself out of his basic market—that of doing electrical work for ordinary people like himself and neighbors.

"Why doesn't he see what he is doing and do something about it?" Electra asked, just like a woman.

"He can't. Both he and the contractor he works for are caught in a machinery called 'collective bargaining', and all such decisions are made for them."

"I thought collective bargaining was a good thing," Electra replied.

"In many ways it is. But like any *collective* activity the individual has to give up his individuality. He delegates his personal responsibilities to the leaders and has to take what they give him. They can give away his business too and he can't do much about it."

They'll have none of mine," she said.

A WAY to bring a shock of realization of what tremendous taxes a private company has to pay has been devised by Idaho Power Co. and used in public meetings. As the meeting starts the clock is set and it is explained that the tax bill the company pays by the minute is shown on the scale. At the end of the meeting the sum of taxes assessed against the company during that very session is plainly visible—a surprisingly large sum. Few people realize how much until it is seen, and many exclaim when they do see. It is impressive to see the seconds ticking up such a sum. The practical-minded Idahoans realize what it means to keep such a taxpayer in their midst rather than have to shoulder in their own taxes all that a government agency would avoid, plus the cost of the government agency besides.

Be Warned!

Thermalite Indicator Automatically Checks Distribution Transformer Loading

You get plenty of warning when overloads caused by load growth are nearing the limits of voltage regulation and transformer capability, thanks to the *Thermalite* overload indicator. A signal light on the transformer, clearly visible from the street, singles out overloaded units without the expense of a complete load survey. You get ample time to make a change in your distribution system without sacrificing service continuity.

On most distribution systems, the peak load is limited by the allowable secondary voltage drop. The *Thermalite* indicator lights up when you've made full use of transformer overload capacity within voltage regulation limits. It does not respond to momentary abnormal overloads.

Operation is simple. A thermal element located in the top oil, away from all live parts, actuates the signal lamp circuit. The brilliant signal lamp remains lit until reset by means of a convenient external handle.

Stretch your transformer dollars by taking advantage of the inherent overload capability of your distribution system without sacrifice of service continuity. The low-cost *Thermalite* overload indicator is available on Allis-Chalmers distribution transformers 100 kva and smaller, 15 kv and lower. A-4078

For more information, contact the A-C district office nearest you, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Thermalite is an Allis-Chalmers trademark.

ALLIS-CHALMERS

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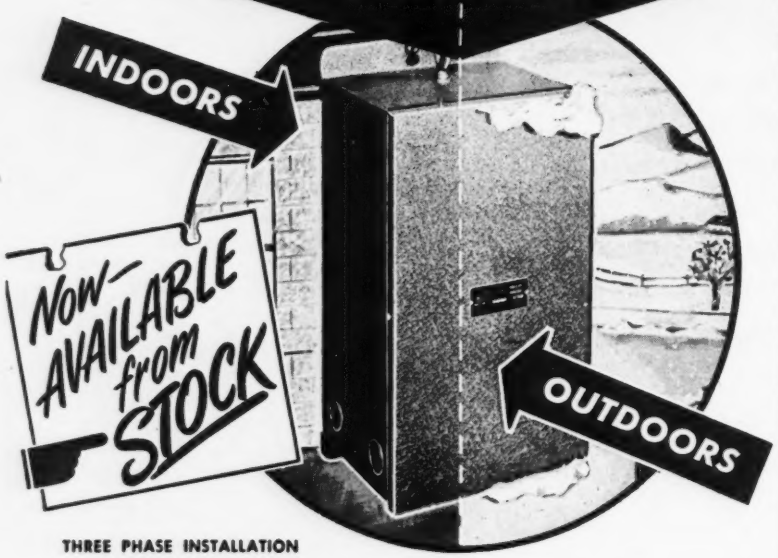
NOW! MARCUS
LIGHTING TRANSFORMERS
for quicker, easier installation



THREE PHASE INSTALLATION

• ECONOMICAL
• COMPACT • EFFICIENT

1 to 3,000 KVA up to 15,000 Volts to meet Individual Requirements
- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

Representatives in Principal Cities

New MARCUS "Type C" general purpose lighting transformers, for installation either indoors or outdoors, are available for immediate delivery in sizes from 1 to 15 KVA, single phase and three phase. The full lighting line is available NOW, from stock, in sizes from 1 to 50 KVA, single and three phase, up to 600 volts. All contain Class B hi-dielectric, hi-heat magnet wire insulated with DuPont's miracle "Mylar" polyester film with at least ten times the puncture strength of standard magnet wire.

New MARCUS "Type C" indoor-outdoor lighting transformers are constructed with electrically welded sheet steel case. Scientifically placed vents provide completely weather-proof ventilation. Self-contained wiring compartment means faster-than-ever installation.

Write for price list

"Mark of Quality"

MARCUS
TRANSFORMER CO., Inc.
HILLSIDE 5, NEW JERSEY

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

ELECTRICAL BOOKS

ILLUMINATION ENGINEERING, second edition, by Warren B. Boast, 340 pages, 6x9, McGraw-Hill Book Co. Inc., $7. This text discusses in detail engineering methods of design of interior and exterior illumination systems, bringing up to date all the material dealing with illuminating devices. Recent advances covered include the equipment and engineering applications connected with fluorescent lamps. Color, an important aspect of lighting, is treated from an engineering point of view. A new introductory chapter on wiring and wiring design for illumination systems has been inserted. It was designed for undergraduate electrical engineering students and as a reference work for architectural students on the subject of electrical equipment in buildings.

ELECTROMAGNETICS, by John D. Kraus, 604 pages, 6x9, McGraw-Hill Book Co. Inc., $9. Intended as a textbook and a reference work for practicing engineers, this volume presents a treatment of electromagnetic theory beginning with elementary principles of electric and magnetic fields, then progresses through the more advanced theory and applications. The first half covers static fields, currents and time-changing fields; the second section is a continuation that treats space waves, guided waves, radiation and boundary-value problems. The text is emphasized by 663 illustrations and drawings. Field mapping techniques include a discussion of Moore's new circle method. The appendix contains a complete table of units and tables and graphs of special functions.

TELEVISION RECEIVER DESIGN, I. F. Stages, by A. G. W. Uitjens, 172 pages, 6x9. Philips' Technical Library, Elsevier Press Inc. (no price given). One of a series of specialized monographs for television engineers and designers, it supplements general treatment of the subject with more consideration of specific problems encountered in design and practice. It deals particularly with pentode amplifiers operating in the frequency range lying between 10 megacycles and over 100 megacycles. It contains 114 illustrations dealing with the application of the pentode in the I. F. part of a superheterodyne receiver and the R. F. amplification in a direct receiver.

ELEMENTS OF ELECTRICITY, fourth edition, by William H. Timbie—assisted by Alexander Kusko, 631 pages, 6x9, John Wiley & Sons Inc., $5.50. An elementary textbook with basic principles of electrical engineering, the content of this edition has been revised to reflect the tremendous growth of the electrical engineering industry since the previous edition. Included in discussions are aluminum wire, ceramic capacitors, transistors, radar, television, dry and gaseous rectifiers.

CODE FOR PROTECTION AGAINST LIGHTNING, National Bureau of Standards Handbook 46, 91 pages, Government Printing Office, Washington 25, D. C., 40c. Supersedes edition H40. It is sponsored by the National Fire Protection Assn., American Institute of Electrical Engineers and the National Bureau of Standards.

the new KILLARK flush switch fitting

Streamlined Design

in Modern ALUMALLOY

...featuring the exclusive Wiring Channels for easier wiring!

Better Working Area on the Inside!

Again, Killark has pioneered in the manufacture of conduit fittings—with the introduction of this modern, streamlined functional design! The big, roomy wiring channels mean faster wiring. The integral end-wall lug design for the cover means more room for easier splicing, too. And the satin-smooth, burr-free interior means an end to scraped insulation—or fingers!

Better Appearance on the Outside!

The famous Killark sparkling-smooth Alumalloy surface offers a lifetime of overall beauty . . . enhanced by such practical design features as the *inside hubs*—stronger in use, easier to handle.

Better Clear Through!

Of course, all the exclusive advantages of Killark Alumalloy are still there: lightweight, strong in service . . . safe and non-sparking . . . never a worry about the elements or chemical fumes, because Killark fittings are rust and corrosion-free for a lifetime of dependable service.

The new "FS" Fittings come in a wide range of styles and sizes — with covers available for every application.

Killark

ELECTRIC MANUFACTURING COMPANY

ENTRANCE FITTINGS • CONDUIT BODIES • FLUSH SWITCH FITTINGS • EXPLOSION-PROOF FIT

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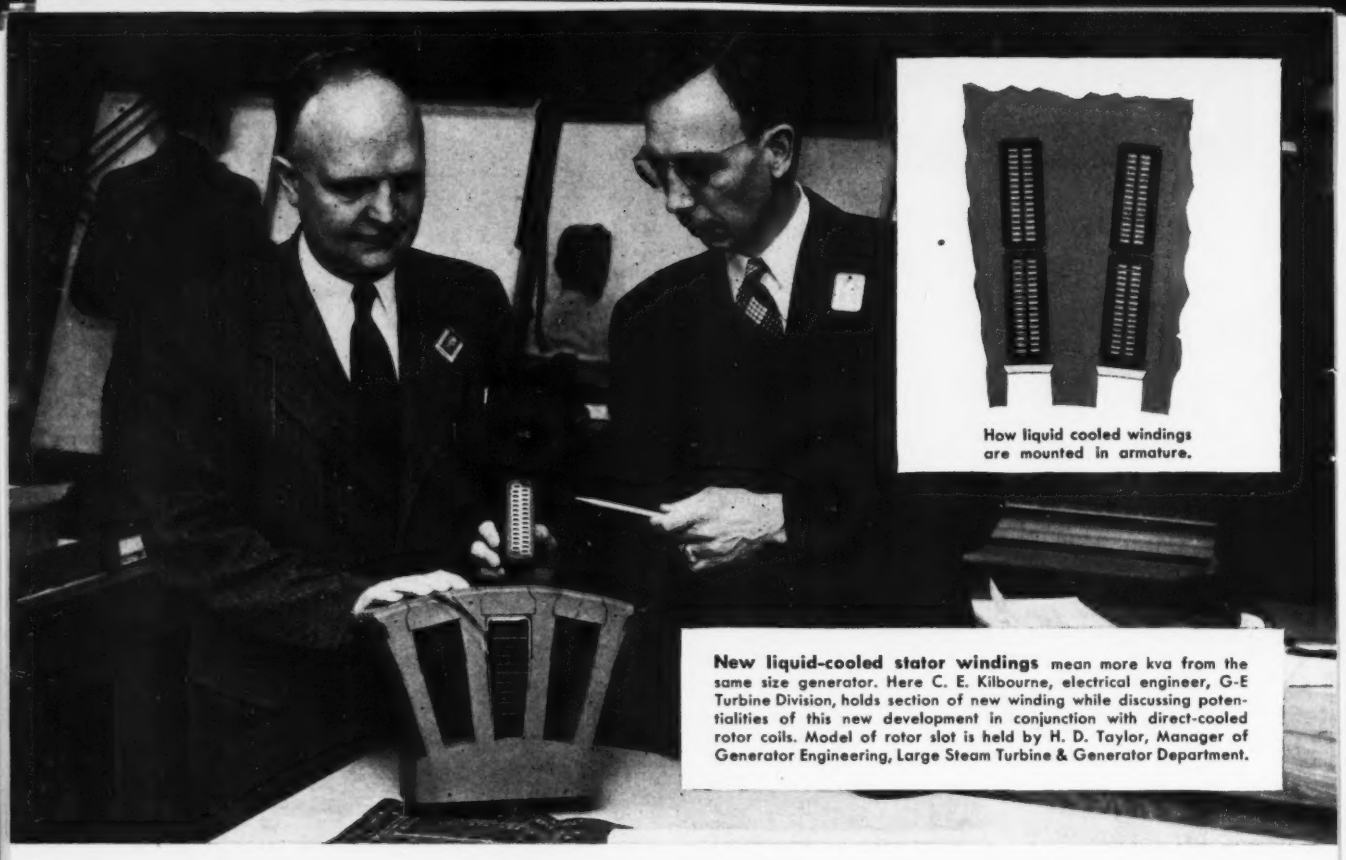


How liquid cooled windings are mounted in armature.

New liquid-cooled stator windings mean more kva from the same size generator. Here C. E. Kilbourne, electrical engineer, G-E Turbine Division, holds section of new winding while discussing potentialities of this new development in conjunction with direct-cooled rotor coils. Model of rotor slot is held by H. D. Taylor, Manager of Generator Engineering, Large Steam Turbine & Generator Department.

LIQUID COOLING EXTENDS GENERATOR CAPABILITY

New developments make possible greater capacity—no increase in size

Liquid flowing through the hollow strands is used to cool the stator winding, while hydrogen gas is used for rotor cooling. C. H. Holley, generator engineer, examines surface scoops which are used to draw in gas which is circulated through the windings of the generator rotor.

Liquid-cooling of generator stators, a new General Electric development, is a major contribution to generator progress. With liquid-cooling, about 15 times as much heat can be removed from the copper . . . therefore, a liquid-cooled winding can carry about four times as much current in the stator bars as can be carried in conventionally cooled windings.

In combination with such advances as direct gas-cooling of the rotor, and grain-oriented steel, G-E engineers are building a 3600 rpm, 260,000-kva generator in a frame size considerably smaller than previous 220,000-kva machines. Full utilization of the possibilities inherent in these developments will permit the construction of even larger capacity single units.

Present indications are that the trend to larger unit sizes will continue. The largest unit presently on order is a cross-compounded set rated 350,000 kva. While it is difficult to predict today what will be the ultimate size of individual generating units that can be economically applied, the nation's electric utilities can be confident that G.E. is fully utilizing every modern design technique to provide needed capacity without necessitating either physically larger machines or larger station structures. For a more complete discussion, write for paper GER-740, General Electric Company, Schenectady 5, New York.

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

301-234

MORE POWER TO AMERICA

GENERAL ELECTRIC

JULY 1953 Vol. 111, No. 1

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.

Can Atomic Energy Power the World?

As known world energy resources become exhausted, the atom can take over to supply man's power needs for millions of years

Dr. Lester E. Reukema

Professor of Electrical Engineering
University of California
Berkeley

1. **What is atomic energy?**
2. **In what ways could man utilize such energy?**
3. **How much atomic energy could in the relatively near future be made available to mankind?**
4. **How would atomic energy compare in cost with conventional forms of energy?**
5. **Could man get along indefinitely without atomic energy?**
6. **Could atomic energy supply all of man's power needs for the several billion years during which life on this planet should be possible?**

Atomic energy is at the same time the oldest and one of the most abundant things in the universe and the newest and the most spectacular of man's achievements. For billions of years many billions of billions of stars have been generating atomic energy by converting hydrogen into helium, releasing as radiant energy the difference between the mass of the original hydrogen and that of the resultant helium. All of the energy radiated by all of the stars throughout all time originates as atomic energy. Moreover, all of the energy in our fossil fuels, such as coal, oil and natural gas, as well as the energy in wood and all growing plants and in winds and falling water, had its origin in the energy received from the sun, therefore in the final analysis represents stored atomic energy.

Recent research has shown man how to generate atomic energy directly by the fission of uranium and plutonium atoms, at a cost competitive with energy generated in conventional steam or hydroelectric plants, and by so doing has multiplied many thousandfold the energy sources available to the human race. It has also made possible new and spectacular ways in which man may utilize energy. Best of all, perhaps, it has made possible in the not too distant future a standard of living for all mankind comparable to that enjoyed now only in a few favored parts of the world.

In any discussion of atomic energy for industrial purposes at least six questions immediately present themselves as essential for consideration. (See box.)

What Is Atomic Energy?

Today every high school student who has had even an elementary course in physics or chemistry should know that the universe is an electrical universe. All of the many millions of chemical compounds comprising the universe are composed of molecules, which are merely various combinations of 92 kinds of atoms, these atoms being miniature solar systems composed of a central, positively charged nucleus and of planetary electrons, which revolve around the nucleus at enormously high speeds, speeds of the order of 5,000 times the speed of a rifle bullet. The atoms differ from each other merely in the number of protons, that is positive particles of electricity, in their nuclei and the corresponding number of electrons, negative particles of electricity, which revolve around these nuclei. The protons and electrons, in turn, are tightly bound concentrations of energy.

A generation ago this electrical idea of the universe was merely a theory, which seemed to explain physical and chemical phenomena better than any other. Today it is a proven fact. In the great cyclotron at the University of California we can start with uranium, the largest and most complicated of the atoms, and by bombarding it with various types of high-speed electrical bullets, such as protons, deuterons or alpha particles, we can knock protons and neutrons out of its nucleus, changing it progressively through all of the atoms in the periodic table, until we finally end with nothing but the electrical particles, electrons, protons and neutrons, and some energy that has been radiated in the process.

The neutrons are particles with practically the same mass as protons, but which are neutral electrically. The nuclei of all atoms, except hydrogen, consist of protons and neutrons. Under certain conditions the neutron may split to form a proton and an electron, in which case the electron is hurled out of the nucleus with explosive violence.

Forty-seven years ago Einstein formulated the equation relating mass to energy, namely $E = Mc^2$, where E

stands for energy in ergs, M stands for mass in grams, and c stands for the velocity of light in centimeters per second, that is 3×10^{10}. This signifies that each gram of mass is equivalent to 9×10^{20} ergs of energy. Perhaps this will mean more to us if expressed in kilowatt-hours, the familiar unit in which we pay our electric light bill. A single gram of matter, that is the weight of a cubic centimeter of water (roughly a half teaspoonful) is equivalent to 25,000,000 kwh or 33,000,000 hp-hr of energy.

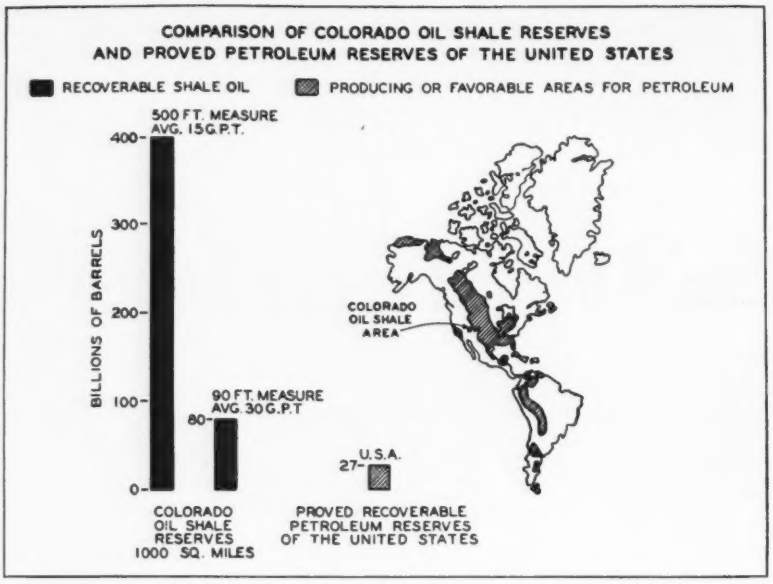
A single kilowatt-hour of energy is sufficient to hurl a quarter ton of water a mile high, and so a single gram of matter, if completely converted into energy, could hurl over 6,000,000 tons of water a mile high. Evidently atomic energy, that is energy generated by the annihilation of mass, is of an entirely different order of magnitude than the energy released in the chemical combustion of fuels or ordinary explosives.

Consider now the energy released in the stars. Each second, in the deep central portion of the sun 617,000,000 tons of hydrogen is changed into about 613,000,000 tons of helium, converting in the process 4,210,000 tons of its mass into atomic energy. When one recalls that a ton is approximately a million grams and each gram is equivalent to 25,000,000 kwh, the enormous rate at which the sun radiates energy becomes apparent, namely 105 millions of millions of millions of kilowatt-hours each second.

The sun has been radiating energy at almost exactly this rate for about three billion years and, unless something unforeseen happens, should continue to radiate energy at this rate for about eight billion years more. Then, due to the blanketing effect of the helium formed and the consequent increase in internal temperature, the rate of energy production will increase sufficiently to turn all of our oceans into steam for about a billion years, to be followed by a period of gradual cooling until a solid crust forms on the sun and the radiation of energy becomes negligible, compared to its present rate.

The enormous amount of radiant energy in the universe may be visualized by noting that the sun is just an average star, one of about 100,000 million similar stars composing our galaxy, and that 1,000 million similar galaxies may be photographed by the Hale telescope on Mt. Palomar. Moreover, astronomers tell us that even this enormous expanse is only an infinitesimal portion of what may be a universe infinite in both time and space.

Although man uses ultimately the energy radiated by the sun, which originates as atomic energy, man could not directly use the sun's process of releasing atomic energy since the enormous pressure and temperature, found at the center of the sun, are not available on earth except for a fraction of a microsecond at the center of an atomic bomb explosion. Moreover, the sun's atomic cycle of several million years would require too long a wait before tangible results could be obtained. However, the fission of uranium and plutonium atoms, when neutrons enter their nuclei, also releases atomic energy.



Extensive shale deposits in Colorado promise to yield large quantities of petroleum

The fact that new neutrons are released in this process makes possible a chain reaction, which in the atomic bomb releases many millions of kilowatt-hours of energy within a fraction of a microsecond. In the nuclear reactors, called atomic piles, the reaction may be slowed down so as to release energy at a rate suitable for generating hundreds of thousands, or even millions of horse power continuously, just as is done in conventional steam or hydroelectric plants.

Although uranium and thorium are the fissionable materials from which man obtains atomic energy, either released explosively in the atomic bomb or gradually in an atomic pile, these metals as found in nature do not release any appreciable amount of energy even over a period of millions of years. Let us see why this is so. Consider uranium as purified from any natural uranium ore. It is always found in the proportion of one part of U235 to 139 parts of U238. These two isotopes of uranium are chemically indistinguishable; however U238 is very slightly heavier than U235 because its nucleus contains three more neutrons than does the nucleus of U235.

Only the U235 goes through the fission process, breaking into two main parts, which might be atoms of krypton and barium, and releasing explosively two or three neutrons. Other U235 atoms can absorb these neutrons into their nuclei only when the neutrons have slowed down to thermal velocities. However, the U238 atoms can absorb them when they are still traveling at high velocity, and there are 139 times as many U238 atoms. Evidently, in the natural state the U235 nuclei have little chance to absorb a neutron, so no chain reaction builds up. To start a chain reaction one might separate U235 atoms from U238, a very slow and costly process, since the two have exactly the same chemical characteristics. An electromagnetic process for accomplishing this separation was developed at the University of California during the early years of the second world war, and a gaseous diffusion process was developed in England. About a billion dollars was invested in plants at Oak Ridge, Tenn., during the war, in which both of these methods were used. Since the end of the war, several billion dollars has been invested by the Atomic Energy Commission in additional plants using the gaseous diffusion process.

During the early years of the war a method of avoiding this slow and costly process of separating the U235 from the U238 was suggested first by Joliot of France, and later perfected by Fermi in the United States and

Oil shale near Rifle, Colo., where the Bureau of Mines operates pilot oil recovery plant

used in the Hanford piles in the State of Washington. Although this process did not actually lessen the cost of obtaining fissionable material for atomic bombs, it did demonstrate one process by which enormous amounts of atomic energy can be released at a controllable rate and thereby pointed the way toward the generation of electrical energy in huge atomic reactors, the so-called breeder piles which make it possible to change the U238, as well as all thorium, into material with the same fissionable characteristics as U235.

In the original Hanford piles uranium oxide powder was placed into hollow aluminum tubes placed horizontally, a short distance apart, in a large pile of chemically pure graphite. Now as each U235 fission takes place, the neutrons released with velocities approaching the velocity of light are slowed down by the graphite atoms, so that when they get into another tube they have merely thermal velocities, so can only be absorbed by U235 atoms. The atomic piles are designed to allow one out of each two to three neutrons released by fission of a U235 atom to be absorbed by another U235 atom, so as to set a definite rate at which energy is released in the pile. Another one of the two to three neutrons enters the nucleus of a U238 atom changing it to U239. U239 has a half life of 23.5 minutes, that is it is radioactive and in 23.5 minutes half of it will have changed into neptunium Np239.

This change takes place because one of the neutrons in the nucleus of the U239 breaks into an electron and a proton and the electron is hurled out explosively, leaving 93 protons in the nucleus instead of the original 92. All uranium atoms have 92 protons in their nuclei. Therefore the new atom, with 93 protons, is no longer uranium. It is a new man-made atom, named neptunium. But neptunium is also radioactive, with a half life of 2.3 days. By emission of another electron from the nucleus it changes to another man-made atom, which has been named plutonium or Pu239. Although plutonium is also radioactive, it has a half life of 24,100 years, so can be stored indefinitely without loss. Plutonium has the same fissionable characteristics as U235. Of course some neutrons are lost due to absorption by impurities or by rods of cadmium or boron steel purposely placed in the pile as control rods.

The purpose of the original atomic piles was not to generate atomic power, but rather to convert uranium into plutonium, the fissionable material used in our atomic bombs. The energy released was an undesirable by-product, which necessitated an enormous amount of cooling water to keep the piles from getting too hot.

During the latter part of the war a million kilowatts of heat energy was absorbed continuously by the Columbia River to keep the temperature of the Hanford piles down to the desired value. Since the end of the war the piles at Hanford, Wash., have been modernized and enlarged until now three million kilowatts are being generated as heat every second of the day by the fission of U235 atoms, all of it being completely wasted in heating the water of the Columbia River, since the function of these piles is to produce plutonium to be used in atomic bombs. When these piles were constructed we knew how to operate such piles at temperatures below the boiling point of water.

However, to generate useful power one must operate at a temperature considerably exceeding the boiling point of water, so as to have available superheated steam for the operation of turbines.

The cost of the original Hanford installation was $350,000,000. The enlargement and modernization cost an additional $700,000,000, and so the total investment at Hanford exceeds a billion dollars. Due to the highly dangerous radioactive atoms formed in the fission of the U235, the piles must be shielded by about eight feet of concrete to protect the operating personnel from the gamma and neutron rays. Also the separation by chemical methods of these radioactive by-products from the plutonium and the original uranium must all be done by remote control, so the operation of the Hanford piles is exceedingly costly. At 3% interest and 7% depreciation, the billion dollar investment represents an annual charge of $100,000,000, or $274,000 a day. Adding the daily cost of operation results in a daily cost of about $350,000. On the assumption that one atom of plutonium is formed for each atom of U235 that is used up, the daily output of plutonium is readily computed from the fact that 3,000,000 kw of heat is produced continuously, or 72,000,000 kilowatt-hours per day.

Recalling that each gram of mass is equivalent to 25,000,000 kwh of energy and that one part in 1,100 of the U235 used up is converted into energy, it is evident that $72{,}000{,}000 \times 1{,}100/25{,}000{,}000 = 3{,}168$ g or 3.168 kg = 6.99 lb of plutonium is produced per day (roughly enough for one bomb of the Nagasaki type). Although the original uranium cost only about $35 per pound, the plutonium produced evidently costs about $50,000 a pound.

Critical Size of a Pile or Bomb

In natural uranium ore a chain reaction never has a chance to get started because the U238 atoms absorb almost all of the neutrons released when a U235 atom goes through fission. As soon as the U235 is separated from the U238, let us say in a gaseous diffusion separation plant, a chain reaction evidently would start, provided that more than one of the two or three neutrons released per fission stays in the mass of U235, thus entering the nucleus of another U235 atom.

If the mass of pure U235 is less than a certain critical value, most of the neutrons fly out through the surface and are lost, so no chain reaction can start. If it is larger than this critical mass a chain reaction will start. In an atom bomb of the type dropped on Hiroshima or Nagasaki the reaction is so fast that almost the entire critical mass goes through the fission process in a fraction of a microsecond, releasing energy equaling that resulting from the explosion of 20,000 tons of TNT.

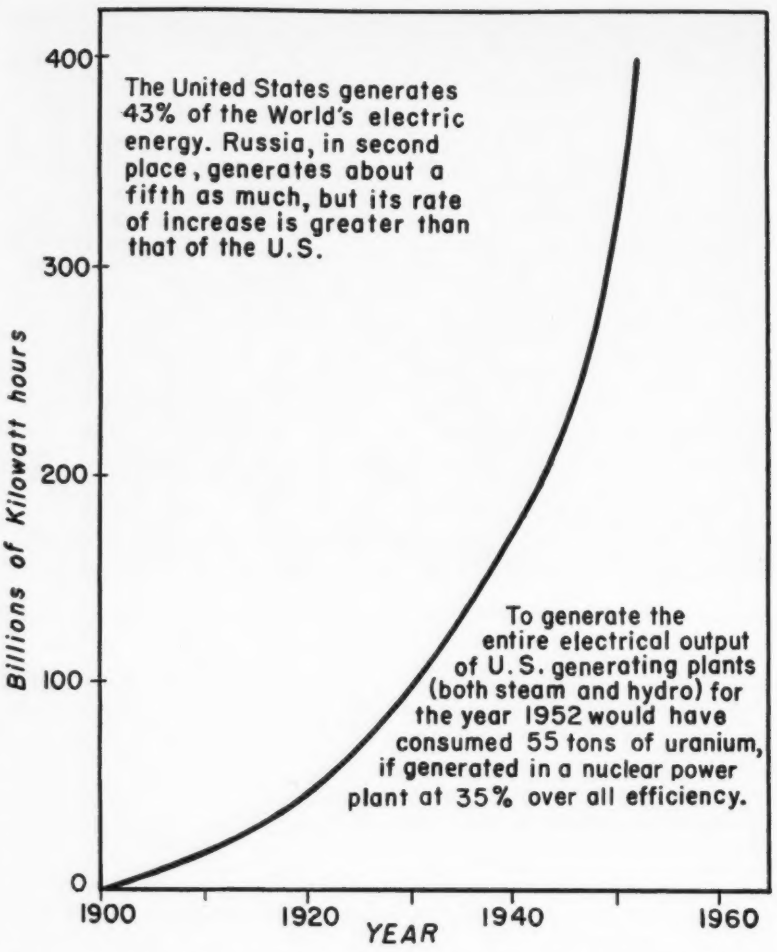
One may readily compute that this corresponds to the fission of approximately two kilograms (4.4 lb) of U235. However, the temperature at the center of such a bomb explosion may be 100,000,000 F (the temperature corresponding to the velocity of the fission fragments is 600 billion degrees centigrade) and the pressure over 100,000,000 atmospheres, so even the strongest steel casing could not hold the fissionable material together long enough for the chain reaction to be consummated. Instead, the inertia of several tons of massive material is used, which explains why only a very large plane can carry an atom bomb.

What has been said about U235 applies equally to plutonium, except that whereas an average of 2.5 neutrons is released per fission of U235, an average of three neutrons is released per fission of plutonium, so that the critical size is somewhat less for plutonium than for U235.

If the energy from a mass of U235 or of plutonium is to be released gradually, as in an atomic engine of propulsion, rather than explosively as in an atom bomb, a mass somewhat greater than the critical value is used, but control rods of cadmium or boron steel, which eagerly absorb neutrons, are allowed to penetrate the mass to exactly the depth needed to restrict the rate of energy release to the desired value. Of course dropping such control rods all of the way down prevents the chain reaction from even starting and stops the reaction when the engine is to be shut down.

A pile containing natural uranium, that is one part of U235 to 139 parts of U238, also has a critical size, depending on the spacing between the aluminum rods containing the uranium oxide powder and on the moderating material, that is the material used to slow down the neutrons. In the Hanford piles the moderator is graphite but in many piles, for instance the one at Chalk River, Canada, it is heavy water, that is water in which the hydrogen atoms are twice as heavy as ordinary hydrogen atoms.

This heavy isotope of hydrogen has been named deuterium and the individual nuclei are called deuterons. A large amount of electric power is needed to separate heavy from ordinary water, so the cost of heavy water is high, $143 per pound or $286,000 a ton. Piles containing natural uranium may contain several tons of uranium as well as many tons of graphite, heavy water or other moderator. Rods of cadmium or boron steel control the rate at which energy is released.


400
300
200
100
0
Billions of Kilowatt hours
The United States generates 43% of the World's electric energy. Russia, in second place, generates about a fifth as much, but its rate of increase is greater than that of the U.S.
To generate the entire electrical output of U.S. generating plants (both steam and hydro) for the year 1952 would have consumed 55 tons of uranium, if generated in a nuclear power plant at 35% over all efficiency.
1900
1920
1940
1960
YEAR

Annual generation of electrical energy in the United States during the past 50 years

Atomic Reactors for Generating Electric Power

Although when plutonium for bombs is urgently needed, the government is justified in operating the Hanford piles in such a way that all atomic energy released is wasted, engineers cannot be expected to be satisfied for long with any method that wastes enough power to supply all of the power requirements of the average large industrial state. Therefore about two years ago three engineering construction companies, in collaboration with five public utilities, proposed to the Atomic Energy Commission that they be allowed to carry on the research and engineering development leading to the construction of large atomic energy plants in Michigan, Illinois, Missouri and California, paying for this research and development with their own money.

In California the two firms concerned are the Pacific Gas and Electric Co. and the Bechtel Engineering Corp. The Bechtel Corp. already has extensive experience along such lines, since in addition to having built many hundreds of millions of dollars worth of steam-electric generating plants, it has also built and operated a model atomic energy plant at Arco, Idaho.

Gordon Dean, the chairman of the Atomic Energy Commission, has recommended that the government build two pilot atomic energy plants (10,000 to 100,000 kw) within a year and start a large atomic plant for generating electric power as soon thereafter as possible.

Dr. Suits, director of research for the General Electric Co., estimates the cost of an atomic reactor, to produce electric power at the rate of a million kilowatts, as being somewhere between $50,000,000 and $100,000,000. Even the higher figure would be economically feasible. At first all of the plutonium produced would be purchased by the government at a cost that would allow the power to be sold at about $.005 per kilowatt-hour.

Later, when bombs are no longer needed, the plutonium would be fed back into the pile to replace the U235, as fast as it is used up, since plutonium has the same fissionable characteristics as U235. Such a pile is called a breeder pile, since it automatically breeds its own fuel by changing U238 into plutonium. The breeder pile makes it possible to use all uranium, rather than merely the U235. It also makes it possible to use thorium, which itself is not fissionable but can be converted in a pile into U233, which is fissionable. Since there is about four times as much thorium in the world as uranium, the development of the breeder pile is evidently one of the most significant developments in the history of science.

It probably will be another ten years before all of the problems connected with the construction and economical operation of a million-kilowatt breeder plant will have been solved. Evidently graphite will not be the moderator used. Instead a liquid metal, such as sodium, potassium, bismuth or lead, or possibly some tin alloy, will be used as both the moderator to slow down the neutrons and as the working fluid. Table I gives the significant characteristics of these metals.

None of these metals absorb neutrons. In the operation of the pile the heat released in the fission of the U235 atoms vaporizes the metal. This superheated vapor gives up its energy in a turbine, then goes to a condenser, where the heat of vaporization is given up to water, producing superheated steam, which goes to another turbine, direct connected to the first. On the same shaft is an electric generator, which turns the mechanical energy into electric energy. In some installations the metal vapor turbine may be eliminated, the heated molten metal giving up its heat directly to produce steam in heat exchangers. Of course the uranium cannot be enclosed in aluminum tubes, since aluminum cannot stand the high temperature needed for high efficiency. Instead a metal such as zirconium would be used.

Since such a plant has not yet been built, it is premature to try to estimate exactly the cost of generating electric energy in such a breeder plant. However, whereas it is certain that such plants will not appreciably reduce the cost of generating electric energy, no one of the teams of engineering construction companies and public utilities which carried on the tests and made their reports to the Atomic Energy Commission last April was pessimistic. All were confident that in the relatively near future very large atomic generating plants for the generation of electric energy should be built and would prove economical.

Moreover, it was felt that a real need exists also for so-called package power plants, plants generating from 25,000 to 150,000 kw, to serve the needs of localities far from economical sources of conventional fuels and far from economical hydroelectric projects. Such plants could use ordinary uranium and be operated as breeder plants, or could use enriched uranium, that is uranium containing more than the one part of U235 to 139 parts of U238, which is always found in natural uranium. The greater the degree of enrichment, the smaller can be the size and weight of the reactor for a given power output. Of course the cost of the enriched uranium is considerably greater than that of natural uranium.

Only that part of a conventional steam electric plant which supplies the steam is replaced by an atomic reactor. The furnaces, boilers, smoke stack, fuel storage spaces and fuel-handling equipment usually represent about 17% of the total cost of generating and distributing electrical energy. Therefore only this small part of the initial cost is affected when a conventional generating plant is replaced by an atomic energy plant. That the introduction of atomic energy should make a significant change in the cost of generating electric energy is not anticipated, except in localities remote from conventional sources of fuel.

Table I

Metal	Specific Gravity	Melting Point	Boiling Point
Sodium	.971	97.5 C	880 C
Sodium potassium eutectic	....	−11 C or 12 F	*815 C
Potassium	.86	62.3 C	760 C
Bismuth	9.78	271 C	1,450 C
Lead	11.35	327.5 C	1,620 C

*Used in experimental breeder reactor at Arco, Idaho.

Atomic Engines of Propulsion

The first atomic engine, suitable for the propulsion of a submarine, was built by the Westinghouse company at Arco, Idaho, and was put through very rigid engineering tests to expose any possible faults and to suggest advantageous changes. A similar improved engine of propulsion is now under construction by Westinghouse for the submarine the *Nautilus*, which is being built by the Electric Boat Division of the General Dynamics Corp. of Groton, Conn. The *Nautilus* should be completed by June 1954 or sooner.

In this reactor water is both the moderator and the primary working fluid. That is, water both slows down the neutrons to thermal velocity and also absorbs the heat, which changes the water to superheated steam suitable for a turbine. Either pure U235 or plutonium can be used as the source of power, which reduces the critical mass to about three kilograms, or, if a beryllium oxide reflector is used, to only 2.4 kg, or 5.29 lb. The specific gravity of uranium is 18.68, so one pound occupies a volume of 1.475 cu in. and the volume corresponding to a critical mass of 5.29 lb is that of a ball 2.5 in. in diameter, roughly that of a tennis ball.

Of course in an atomic engine of propulsion a mass considerably greater than the critical mass would be used and the rate of energy release would be controlled by the position of control rods. Also the fissionable material would not be concentrated in a solid ball, but rather in parallel plates with the working fluid between the plates, so that the generated heat could be readily absorbed by the working fluid. The volume occupied by the fissionable material therefore would be roughly several times that of a football, rather than that of a tennis ball. Even this gives a very high concentration of energy, approximately four kilowatts per cubic inch (9,200 hp per cu ft), as compared with about 0.7 kw per cubic inch as the greatest concentration of energy in marine steam boilers or in jet engines of fighter planes.

A second atomic engine for the propulsion of a submarine is under construction at the Knolls Atomic Power Laboratory of the General Electric Co. This reactor will use enriched uranium as the nuclear fuel. The working fluid will be liquid sodium. Since the boiling point of sodium is 880 C, evidently intermediate energy neutrons will be used, rather than the thermal energy neutrons used in the

Westinghouse Electric Corp. reactor.

The actual speeds and ranges of these two atomic powered submarines will of course remain secret at least until speed runs have been made. Information released merely states that the submarines will travel at speeds in excess of 20 knots (23 miles per hour) and will have at least round-the-world range. That submarines ultimately can have speeds and ranges enormously exceeding these figures is, of course, evident from the fact that a 15,000-hp engine can operate continuously for more than a year on just one 30 lb of plutonium as fuel.

The Westinghouse company also has a contract to develop an atomic power plant to power major naval vessels, such as aircraft carriers. Here it is not essential to keep weight down to a minimum value, so a breeder-type reactor using natural uranium probably will be used. This could well be the forerunner of large power plants to generate electric energy for distribution to homes and industries, as well as to power large vessels of both commercial and naval types.

Nuclear power plants for aircraft are also being designed by Pratt and Whitney Aircraft Co. of East Hartford, Conn., in collaboration with Boeing Aircraft Corp. and by General Electric Co. in collaboration with Consolidated Vultee Aircraft Corp. Such designs will also point the way to atomic propulsion for long-range guided missiles.

Since electric energy generated in an atomic pile will cost about as much as electric energy generated in our best steam or hydroelectric plants, just what are the advantages of atomic energy? One may nicely visualize one advantage by comparing the amount of fuel consumed in a conventional steam-electric plant burning coal with the fuel needed by an atomic plant of the same generating capacity. Our best steam plants now generate one kilowatt-hour per pound of coal, so a 250,000-kw plant at a 50% use factor uses

$$\frac{250{,}000 \times 12}{2{,}000} = 1{,}500 \text{ tons of coal per day}$$

in the generation of 3,000,000 kwh.

Let us see how many kilowatt-hours could be generated by a single pound of plutonium or U235. Since each gram converted into energy represents 25,000,000 kwh and one part in 1,100 of the fissionable material is converted into energy, one pound of U235, which equals 453.6 g, would generate at an assumed efficiency of 35%,

$$\frac{25{,}000{,}000 \times 453.6 \times .35}{1{,}100} = 3{,}600{,}000 \text{ kwh.}$$

Energy Sources of the World

	Equivalent Tons of Coal	Equivalent Tons of Uranium
Coal	7.45×10^{12}	2.48×10^{6}
Oil from wells (610 billion bbl)	$.135 \times 10^{12}$	$.045 \times 10^{6}$
Natural gas ($1{,}800 \times 10^{12}$ cu ft)	$.110 \times 10^{12}$	$.0367 \times 10^{6}$
Oil from oil shale (1,250 billion bbl)	$.278 \times 10^{12}$	$.0927 \times 10^{6}$
All fossil fuels	8.0×10^{12}	2.67×10^{6}
Probably recoverable from fossil fuels	3.5×10^{12}	1.167×10^{6}
Uranium in ores containing 0.1% or more of uranium	75×10^{12}	25×10^{6}
Uranium in tar sands (0.03% uranium)	900×10^{12}	300×10^{6}
Uranium in oil shale (0.03% uranium)	$1{,}125 \times 10^{12}$	375×10^{6}
Uranium in ocean water (five parts per billion)	$4{,}500 \times 10^{12}$	$1{,}500 \times 10^{6}$
Uranium in the 10 mile thickness of the earth's rocky crust (one part per million)	$72{,}000{,}000 \times 10^{12}$	24×10^{12}
Total thorium (about four times as plentiful as uranium)	$288{,}000{,}000 \times 10^{12}$	96×10^{12}

Note: One ton of uranium is equivalent in energy content to 3,000,000 tons of bituminous coal.

Note: The energy in the uranium in tar sands and oil shale alone is 250 times that in all fossil fuels.

Evidently a single pound of U235 or of plutonium will generate more electrical energy than 1,500 tons of coal. Therefore visualize on the one hand a trainload of 30 cars of coal, each car carrying 50 tons, and on the other hand a single pound of plutonium with a volume about that of a walnut. Evidently in regions remote from sources of conventional fuels and far from economical hydroelectric power the compactness and negligible weight of plutonium or U235 for the atomic energy plant are of inestimable value. Note that in countries having little ordinary fuel the cost of generating electric power may be three to ten times what it is in the more favored regions of the United States. Yet the cost of flying in plutonium for an atomic energy plant is completely negligible.

Cost Comparison

Comparing the cost of U235 or of plutonium with that of coal shows that these fissionable materials are competitive with coal. Although we showed that plutonium produced at Hanford costs about $50,000 per pound, it is possible to produce it considerably cheaper. The first plant of its kind to be produced always costs far more than following plants, especially when nothing is known about the safety precautions that are necessary. Every part of the design requires painstaking and elaborate research, and speed of construction is absolutely essential. Moreover, in these reactors all of the heat energy is being wasted.

In a dual-purpose reactor, generating electric energy and plutonium, the plutonium could be produced for about $20 per gram or about $9,000 per pound. Since a pound of plutonium generates more power than 1,500 tons of coal, plutonium is evidently competitive with coal even in regions not very far from the mines. The Detroit Edison Co. is today paying $7.18 per ton for coal at Detroit, Mich. In England today, however, it costs $17 per ton to mine coal and transport it to the port, where it is to be loaded on a vessel. France today is paying $26 a ton for American coal. Even $10 a ton for 1,500 tons considerably exceeds the $9,000 per pound for the U235 or plutonium which will do the same amount of work.

Another big advantage of an atomic energy plant is that no air is necessary for combustion of the fuel, since no combustion takes place in an atomic energy plant. This is of vital importance in the use of an atomic engine for propulsion of submarines.

Submarines using conventional fuel need enormous amounts of air for the combustion of this fuel. Therefore they must operate on the surface most of the time or only slightly submerged with a snorkel or breathing tube reaching up to the surface to take in the air needed by the diesel engines. This makes them very vulnerable to detection by radar in searching planes. However, a submarine with an atomic engine of propulsion can remain submerged 1,000 ft while it travels thousands of miles. It is thus practically impossible to detect except by other submarines or by underwater listening devices installed near important ports. Almost certainly within a few years most, if not all, of our submarines will have atomic engines of propulsion, and almost as certainly the Russians will not be far behind us.

Of course the enormous increase in

Economics of Atomic Power

For a nuclear power plant with a useful electrical output of a million kilowatts at 50% load factor and 35% over-all efficiency, using natural uranium as fuel and a molten metal as the working fluid and moderator:

Annual electrical output	4.380×10^9 kwh
Annual heat output of reactor	5.150×10^9 kwh
Uranium consumed per year (one lb per 3,600,000 kwh)	1,430 lb
Uranium content of reactor	572 tons
Volume of uranium (1,165 lb per cu ft)	973 cu ft
Initial cost of uranium at $35 per lb	$40,000,000
Annual cost of replacement uranium	$50,000
Percentage of initial uranium consumed annually	0.125%
Coal per year to generate same power in a conventional steam-electric plant	2,200,000 tons
Cost of coal per year for conventional plant at $7.50 per ton	$16,500,000

Note: This analysis assumes 0.7 kw heat output per cubic inch (1.03 heat kw per pound) of uranium. Although 4 kw per cubic inch can be realized in a nuclear engine of propulsion using plutonium or uranium 235 as fuel, 0.7 kw is a more reasonable value for a reactor using natural uranium.

range is also a vital advantage for submarines, and even more so for airplanes and long-range guided missiles. The atomic engine of propulsion should even make possible trips by guided missiles, with or without personnel, to the moon and later, perhaps, even to Mars.

Atomic Propulsion for Automobiles

The question arises "Will we have atomic propulsion for our automobiles in either the near or the remote future?" The answer is very definitely "No." An atomic reactor must be very heavily shielded to prevent dangerous gamma and neutron rays from the radioactive atoms, formed in the fission of U235 or plutonium, from injuring the personnel. In even a 10,000-kw plant 33.7×10^{16} atoms undergo fission each second, resulting in 67.4×10^{16} radioactive atoms each second, a lethal exposure at a distance of ten meters in two minutes.

To prevent the neutron rays from emerging, a shield of light atoms, such as graphite, or light molecules, such as water, is needed. To prevent the gamma rays from getting out, a shield composed of heavy atoms, such as lead, is needed. Even for the smallest feasible atomic engine such a shield would weigh about ten tons, which effectively eliminates the atomic energy plant from consideration for the propulsion of automobiles.

How Long Could Coal, Oil and Natural Gas Take Care of Our Power Needs?

Our civilization depends upon power. The United States produces and consumes over half the products of the world because it produces over half the power that is used by the world in mining, refining oil and metals, transportation, communication, manufacturing and the generation of electric energy. With only 7% of the world's population, the United States uses about half of the coal, 60% of the oil, 88% of the natural gas and more than a quarter of the world's developed water power. The American workman uses an average of about 7.5 hp in his work, which is about four times the horse power available per worker in most of the other industrialized nations of the world.

This is the major reason why the standard of living in the United States is so much higher than in most other countries. The United States also has far more than its share of the fuel resources of the world, approximately half of the coal, a third of the proved petroleum reserves and a fifth of the estimated ultimate petroleum production, probably at least a quarter of the natural gas. Since a high standard of living requires high productivity per worker, which in turn requires ample sources of energy, two questions immediately arise.

First, how long can our conventional fuels supply the energy the world needs? Second, what will supply the needed energy when conventional fuels have been exhausted? No certain answer is available to either question, since only very approximate estimates can be made of either our total fossil fuel reserve or of probable rate of use of energy in the future.

The United States consumed 550,000,000 tons of coal, about two billion barrels of oil, and 3,500 billion cubic feet of gas in 1950. In energy content a ton of coal is equivalent to 4.5 bbl of oil or to 16,400 cu ft of gas. The coal equivalent of the energy consumed by the U. S. in 1950, including the fuel that would have been needed to supply the electric energy generated in hydroelectric plants, and the energy of the wood burned totals 1,315,000,000 tons.

For the United States alone the coal reserve is estimated as 3.65×10^{12} tons; the probable petroleum reserve is about 70 billion barrels; and the probable gas reserve about 300 trillion cubic feet; giving a coal equivalent for all fossil fuels in the U. S. of about 3.7×10^{12} tons. Dividing this by the coal equivalent of the energy consumed in the U. S. in 1950 gives 2,810. This, however, does not mean that our fossil fuels could supply our energy needs for 2,810 years, since much of both coal and oil lies in such position that it cannot be recovered economically.

The National Coal Assn. estimates that, of the probable coal reserve of 3.65×10^{12} tons, about 1.6×10^{12} tons may ultimately be used. This alone cuts the 2,810 years down to 1,230 years. Moreover, our population is rising steadily and is expected to stabilize at approximately twice the present value. The energy consumed per person is also rising and may well double. These two factors cut the 1,230 years to not much more than 300 years.

The contribution that might be made by hydroelectric power is not large, since it contributes less than 1% of our total energy now, and could not be multiplied by more than five if all economical hydroelectric projects were developed. The 300 years, during which all of our conventional fuels could supply our power needs, seems woefully small when compared with eight billion years, during which the earth may be habitable and the human race will need power to maintain a comfortable standard of living.

How Long Could Uranium and Thorium Take Care of Our Power Needs?

The richest uranium and thorium ores are pitchblende, thorianite, thorite, uranite lime and zeunerite. Pitchblende contains 25 to 80% U and 1 to 6% Th; thorianite contains 4 to 10% U and 60% Th; thorite 1 to 9% U and 40 to 60% Th; uranite lime and zeunerite contain 50% U. Although these minerals are widely distributed, they are not plentiful. The Belgian Congo in Africa and the Canadian uranium mines at Great Bear Lake and Lake Athabaska con-

How Soon Will We Have Atomic Power?

Starts on Page 73

tain the largest concentrations of these minerals so far discovered.

If these high-grade ores were our only source of uranium or thorium, these metals could take care of our power needs for a much shorter time than the conventional fuels, coal, oil and natural gas. However, carnotite and monazite ores containing about 0.1% of uranium and thorium respectively are fairly plentiful.

About 50,000 square miles in Colorado, Utah, Arizona, and New Mexico contain carnotite. This area now ranks second only to the Belgian Congo as a source of uranium. Most gold ore contains an appreciable percentage of uranium and thorium. The enormous piles of worked ore, which have accumulated outside of the South African gold mines, are now being worked profitably for uranium.

However, the almost unbelievable amounts of uranium that can be secured from oil shale makes this our major source of energy for many thousands of years after our coal, oil and natural gas are exhausted. Oil shale averages about 0.03% uranium and there are 1.25×10^{12} tons of oil shale in the world, 55% of which lies in the United States. Oil shale also averages about a barrel (42 gal) of oil per ton, together with significant amounts of aluminum, iron, magnesium, potassium, sodium, sulfur, ammonia and vanadium.

Fortunately most of the oil shale of the United States involves only surface mining, as it exists in the form of solid cliffs thousands of feet high and can be mined with a steam shovel. The energy content of a barrel of oil is 2,279 hp-hr; so at one barrel of oil per ton of oil shale, the energy in the oil in 1.25×10^{12} tons of oil shale is 2.85×10^{15} hp-hr.

The energy in all coal, oil and natural gas of the world, excluding that in oil shale, is 7.95×10^{16} hp-hr, so the oil alone in the oil shale represents an amount of energy about 3.6 as great as that in all other fossil fuel, and therefore somewhat greater than that in all oil and gas from wells. However, the energy in the uranium in the oil shale is 9.1 million horsepower hours per ton of oil shale (containing 300 g of uranium); so the 1.25×10^{12} tons of oil shale represents 1.136 $\times 10^{19}$ hp-hr, which is 2,000 times as much as the energy in the oil of the oil shale and 143 times as much as the energy in all fossil fuels. If coal could supply our power needs for 300 years, the uranium in oil shale could supply it equally well for 50,000 years.

At present prices of oil and uranium in the United States, it is not economical to mine, crush and retort oil shale, although it is used extensively in Scotland, and Sweden is actually using oil shale as her source of uranium. However, our petroleum from wells will be exhausted in a few years. Moreover, only a slight increase in the price of uranium would make it economical to work oil shale for its uranium, in competition with uranium from carnotite ores.

Possibly oil shale will be worked in the near future for its sulfur and ammonia content, even before we need its oil and uranium. At the present price of $35 per pound of uranium, the uranium in a ton of oil shale is worth $21. However, at 35% over-all efficiency of a breeder reactor and 0.5c per kilowatt-hour, the electric energy from the uranium in a ton of oil shale is worth $11,900. Tar sands, of which there are at least a trillion tons, also contain significant percentages of uranium and thorium. Moreover, the rocks of the earth's crust all contain both uranium and thorium. For instance, granite contains four parts per million of uranium and 12 parts per million of thorium, that is 16 g of uranium and thorium combined per ton of granite.

Of course at present prices it would not be economical to get uranium or thorium from granite, since at $35 per pound the 16 g per ton of granite would be worth only $1.24, which is considerably less than the cost of grinding up the granite. However in a breeder reactor, assuming an over-all efficiency of the electric generating station of 35% and a value for the electric energy of .5c per kilowatt-hour, the uranium and thorium in a ton of granite would generate $20 \times 25 \times 10^6 \times .35 \times \$.005/1{,}100 = \$795$ worth of electricity.

Does anyone believe that, when present fuels, including the oil and uranium in oil shale, are used up, it will not be economical to use the uranium and thorium in granite? Moreover, most of the sedimentary rocks of the earth's crust contain larger percentages of uranium and thorium than does granite.

The sea also contains about five tons of uranium and twenty tons of thorium per cubic mile of sea water, and comparable or larger amounts of gold, silver, platinum and other valuable metals. Although the uranium and thorium in the ocean represent only about five parts per billion parts of water, the energy content of the uranium and thorium amounts to a kilowatt-hour for every 20 lb of sea water. The approximately 3×10^8 cubic miles of water in our oceans contains about 75×10^8 tons of uranium and thorium.

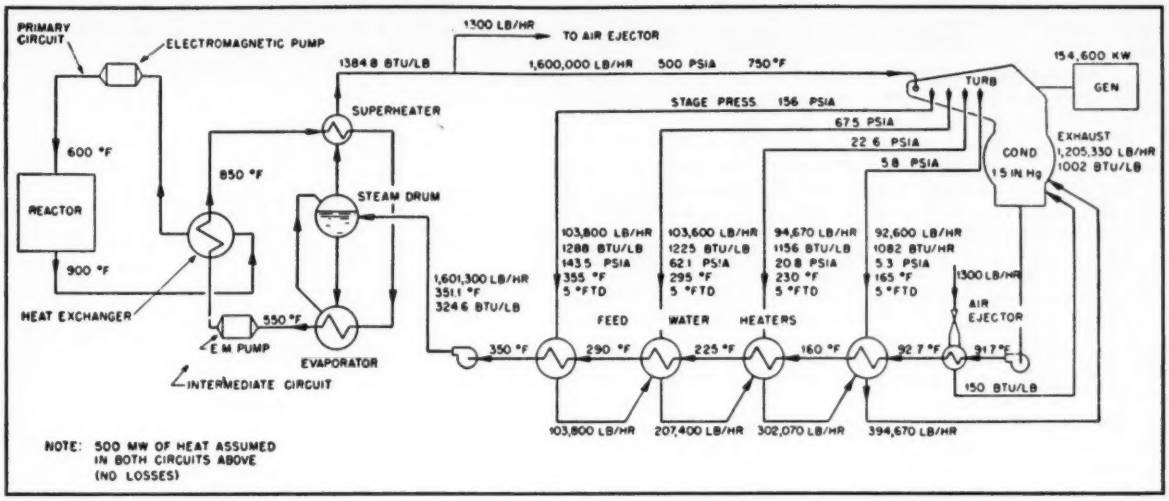
Since a breeder pile at 35% efficiency can develop 3,600,000 kwh of electric energy per pound of uranium or thorium, the electric energy that could be developed from the uranium and thorium in the sea amounts to about $.54 \times 10^{20}$ kwh, which is more than a hundred million times as much as the energy used for all purposes by all people on earth in 1950.

Of course the energy content of the uranium and thorium in sea water would not be sufficient to evaporate the water. However, if in the future the world needs more fresh water than would otherwise be available, the energy which could be obtained from the uranium and thorium in sea water might be the decisive factor that could make economical obtaining fresh water from the unlimited supply of salt water in our oceans.

Even the basalt which forms most of the earth's crust contains about one part per million of uranium and thorium. If all the uranium and thorium in the earth's crust were used to supply energy it could take care of our power needs for a period considerably exceeding the eight billion years during which the human race might need power.

No one thinks that all of the uranium and thorium in the earth's crust will be so used, or even could be, since long before we start using such poor ores it will be more economical to use sunlight directly. Even in the present state of our knowledge it costs only about ten times as much to develop power by means of equipment that utilizes sunlight directly as it does to produce power by burning coal or oil.

Intensive research could probably reduce that cost by at least a factor of three. So direct utilization of sunlight probably will supply our power needs for at least most of the latter part of that eight billion years. It is comforting, however, to know that in any event atomic energy generated by fission of uranium and thorium could handle the job if necessary. Although at present the atomic bomb gets the headlines, the use of atomic energy for peaceful industrial purposes to satisfy man's power needs for at least millions of years and to give to all mankind the high standard of living, which is possible only when power is plentiful and economical, is of inestimably greater importance.



Heat balance in a sodium-cooled fast reactor. Gross power 154,600 kw; net power 145,300 kw; net station heat rate 11,760 Btu-kwh

Western Atomic Power Plant Design

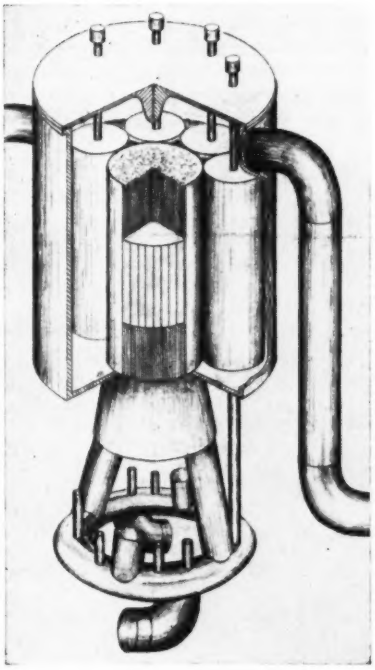
As Proposed by PG and E – Bechtel Team

Under the terms of an agreement with the Atomic Energy Commission, representatives of the Pacific Gas and Electric Co. and the Bechtel Corp. have made a survey and study of the commission's reactor development activities, with principal attention directed toward those types of reactors being actively developed by AEC laboratories and contractors. The purpose of this survey and study has been to evaluate the technical and economic feasibility of building and operating a reactor for the production of power and plutonium as a part of an existing public utility system.

Following is an abstract of a summary of the declassified version of the PG and E-Bechtel report published by the AEC for release May 31, 1953.

Detailed cost and engineering studies were limited to two representative types of reactors. One was a water-cooled thermal converter reactor in which ordinary water would be used as the coolant, with heavy water serving as the moderator. The steam conditions at the turbine throttle for this plant would be 165 psig and 375 F. The other study was made on a liquid-metal-cooled fast breeder reactor. The throttle steam conditions in this case are 485 psig and 750 F.

Consideration was given to a fast reactor of the liquid-fuel type, but the present stage of development does not permit a cost study to be made.



Artist's conception of the core tank for a sodium-cooled fast reactor. Sodium is a liquid metal that offers great promise as compared to water for cooling a reactor and producing steam through a heat exchanger

The conclusions resulting from this study are as follows:

1. The design and construction of reactors to produce fissionable materials and power is now technically feasible.

2. The water-cooled thermal type of reactor has reached a point in engineering development that permits its construction and operating costs to be predicted with a fair degree of accuracy. It appears that detailed design of such a reactor could be started promptly; and, if the primary emphasis is placed on plutonium production at the earliest possible date and for a definite production period, this type of reactor would be very attractive.

3. The liquid-metal-cooled fast reactor has the advantage of conserving the existing supply of uranium and promises to be adaptable to high-pressure and high-temperature steam conditions such as used in present-day power plants. This makes it much more attractive as a power producer, and the engineering background is considered to be well enough developed at present to justify proceeding with a program for design and construction even though certain development work will be required during

Atomic Fuel Breeding Successful

The principle of breeding has been successfully demonstrated at the Argonne National Laboratory in Idaho, announces Gordon Dean, chairman of the Atomic Energy Commission. The reactor is operating in such a way that it is building up uranium 235 and, in the process, is changing nonfissionable uranium into fissionable plutonium at a rate that is at least equal to the rate at which the uranium 235 is being consumed. This milestone in atomic development holds promise of making a civilian atomic power industry even more feasible and attractive in the long range than it has hitherto appeared to be.

the time required for proper design.

4. The liquid-fuel fast reactor appears to have the greatest possibility of low-cost power production, but the amount of development remaining to be done prevents design and construction of such a reactor in the near future.

5. The estimates in this study do not indicate that the sale of power from a dual-purpose reactor will reduce the cost of plutonium production by a substantial amount. They do, however, indicate that the sale of power will more than justify the cost of the power-generating equipment in a dual-purpose installation. This does then economically permit, under present plutonium demand and cost conditions, the building of dual-purpose reactors that may have continuing economic value solely as power producers after the plutonium demand is over. At the same time this permits increasing the experience in reactor technology, which is essential to the ultimate development of reactors for producing power only on an economic basis.

As a result of these studies it is recommended that:

1. The development and design of a liquid-metal-cooled fast breeder with solid fuel elements be undertaken promptly.

2. On completion of this design, construction be started unless the development of other types, such as the liquid-fuel reactor, has made the plans obsolescent.

3. Concurrently with preparation of the aforementioned designs, the commission should continue the aggressive development of a liquid-fuel breeder reactor so that it can be programmed for commercial construction and operation as early as practical, provided development and studies indicate and confirm that this type of reactor has a definite promise of being more economic than other types of reactors.

Atomic power, having high capital cost and low fuel cost, would be economically justified first where it could operate at a high capacity factor and earn maximum power revenue. Such power could well be integrated into a large system like that of Pacific Gas and Electric Co., which has a large and rapidly increasing power demand, approximately one-third of which is base load power.

A 500-megawatt (heat release) reactor was selected as a reasonable size for this study. The corresponding net electric power output will be 100 to 150 mw and is roughly equivalent to the maximum feasible size of turbine units at lower pressures. It would produce significant amounts of power and plutonium and would be a compromise between a smaller developmental size and a large, more economic size. Further study should be given to the size of the first dual-purpose reactor that may be constructed.

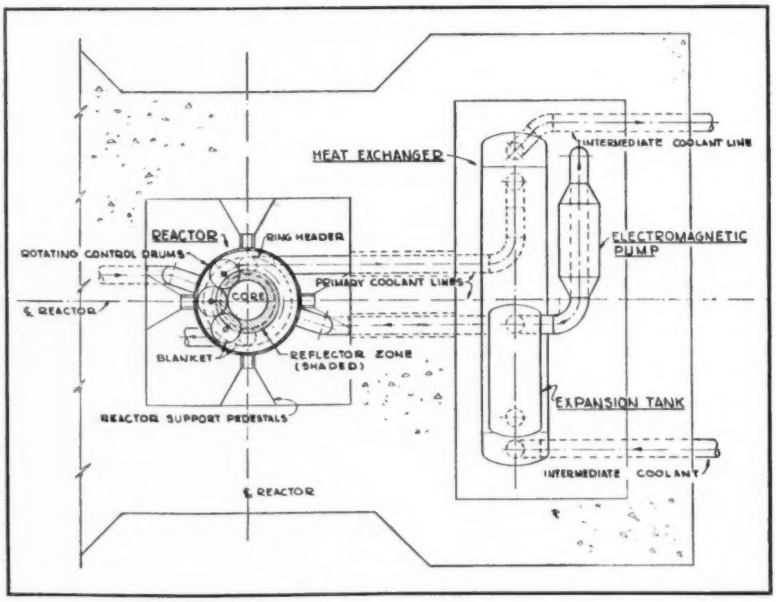
A preliminary cost study was made for three distinct types of reactors that appeared most promising for economic power and plutonium production. These three reactors were (1) the fast breeder type proposed by the Knolls Atomic Power Laboratory (KAPL). (2) the aqueous homogeneous reactor proposed by the Oak Ridge National Laboratory, and (3) a D_2O (heavy water)-cooled and D_2O-moderated heterogeneous reactor as proposed by the Argonne National Laboratory (ANL).

This preliminary study indicated that, after taking credit for the power produced, the cost of plutonium in all three cases is competitive with present-day costs for plutonium produced by production reactors. The costs used in this preliminary study were taken from estimates prepared by the sponsoring laboratories.

Since the differences in cost appear to be within the probable error of the estimates, it was considered that no one type had a significant cost advantage. The choice of a reactor for more detailed study, therefore, was based on technological considerations.

The remaining development to be done on the homogeneous reactor is so uncertain that the preparation of a design by the companies for a detailed cost analysis appeared to be impractical, and there is no positive assurance that such a reactor is feasible. It was decided that no further attempt would be made to apply this reactor to a power plant design for the present.

It became evident that the most technically feasible dual-purpose reactor to date did not have the features that would seem to be required in a future power reactor. Consequently two reactors were chosen for detailed study: one having immediate



Plan drawing of sodium-cooled fast reactor using liquid sodium flowing at high velocity

technical feasibility and the other having more development problems but greater promise as a future power reactor.

The light-water-cooled heavy-water moderated reactor was chosen because it can be designed and built more quickly than other types and its cost can be predicted with some feeling of confidence. On the other hand, it is limited to low steam pressures with the associated low thermal efficiency. For this reason it is expected that the water-cooled reactor will not be the ultimate power reactor but will be superseded at some time in the future.

The liquid-metal-cooled fast reactor was selected because of its ability to breed new fissionable material and to operate at high temperatures, both features being desirable in the nuclear power field.

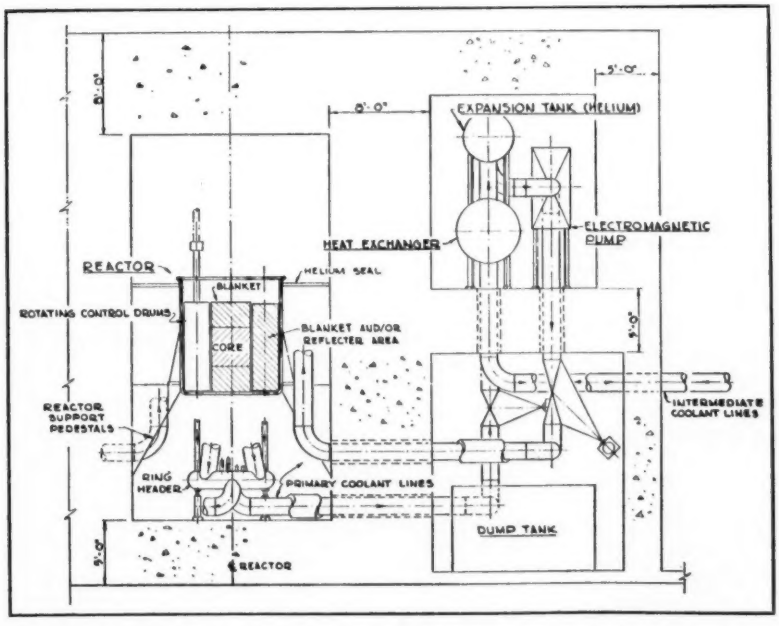
Water-Cooled Natural-Uranium Reactor

A preliminary design of a water-cooled natural-uranium reactor was worked out in sufficient detail to form a basis for describing a practical combination of a reactor and turbogenerator plant, establishing a basis upon which cost estimates may be made, establishing a basis for organizing a detailed engineering design, and pointing out the avenues along which detailed development is necessary before building such a plant.

The principal design and operating conditions for the reactor core are presented in Table I. Essentially the reactor consists of an aluminum tank, with a multiplicity of aluminum tubes between tube sheets, serving as the container of the moderating heavy water. The fuel is placed in pressure tubes which extend through the core tank concentric to the aluminum tubes. Light water, the primary coolant, flows through these pressure tubes.

Table I
Design and Operating Data for Dual-Purpose Reactors

Data	Water-Cooled Thermal Reactor	Sodium-Cooled Fast Reactor
Power:		
Heat produced, megawatts	500	500
Gross electric power, megawatts	106.2	154.6
Net electric power, megawatts	100.6	145.3
Capacity factor	0.75	0.80
Millions of kw/year (net)	659	1,018
Materials:		
Fuel	Nat. U, 60 tons	U235
Fertile material		U238
Core size	13.2 ft dia. x 11 ft high	38 in. dia. x 38 in. high
Moderator	D_2O	None
Reflector	H_2O	Pb
Shield	Concrete	Concrete
Primary coolant	H_2O	Na
Coolant:		
Primary-coolant temp.:		
In, ° F	384	600
Out, ° F	500	900
Primary-coolant pressure, psig	1,000	
Moderator temp.:		
In, ° F	120	
Out, ° F	180	
Secondary-coolant temp.:		
In, ° F		550
Out, ° F		850
Steam conditions:		
Pressure, psig	160	485
Temperature, ° F	378	750
Temperature coefficient of reactivity	Negative	
Control method	Plates and temp. coefficient	Blanket control



Sectional drawing of fast sodium-cooled reactor shows arrangement of vital components

The primary coolant is circulated between the reactor and the steam generators by means of high-capacity circulating pumps. Leakage from these pumps is considered a less serious problem than in the case of a shipboard installation. The pumps are conventional centrifugal pumps with injection glands to prevent leakage of radioactive water. The valves are similarly equipped with injection glands.

The piping system is weldable 18-8 stainless steel. Although a low-alloy piping system may be feasible from the standpoint of corrosion, it would permit greater pickup of metallic ions, which would become radioactive in passing through the reactor. To avoid leakage of these ions, such a system must be completely canned at an expense offsetting the expense of 18-8 stainless steel piping.

The steam generator is divided into four sections, each located in a separate shielded cubicle adjacent to the reactor. Each section has a separate drum for disengaging entrained moisture. The drum and shell side of the heat-exchange section are fabricated of carbon steel and designed for an operating pressure of 250 psig. The tube side, however, must be of stainless steel and designed for operating conditions of 1,100 psig and 600 F.

Auxiliary facilities provided for the primary coolant system include pressurizer, degasifier, emergency cooling

Table II
Estimated Operating Costs for Dual-Purpose Reactors

Data	Water-Cooled Thermal Reactor	Sodium-Cooled Fast Reactor
Reactor plant:		
Operation:		
Operation (46 at $5,500 average)	$253,000	$253,000
Health physics (16 at $5,000 dverage)	80,000	80,000
Technical services (13 at $6,000 average)	78,000	78,000
Security (22 at $4,000 average)	88,000	88,000
Administration (6 at $6,000 average)	36,000	36,000
Supplies	50,000	50,000
Total operation	585,000	585,000
Heavy-water make-up ($7,000,000 at 5%)	350,000	.....
Maintenance (1% of capital excluding heavy water)	170,000	330,000
General expense (15% of operation and maintenance)	115,000	140,000
Total reactor plant	1,220,000	1,055,000
Power plant:		
Operation ($1.70 per kw-year)	180,000	265,000
Maintenance (1% of capital)	130,000	140,000
General expense (15% of operation and maintenance)	50,000	60,000
Total power plant	360,000	465,000
Total estimated annual operating cost	1,580,000	1,520,000

pump, gland injection pump, off-gas pump, dump tank and make-up pump.

The moderator-cooling system is designed to handle 7.5% of the total heat output from the reactor (37.5 mw) and to cool the D_2O from 180 to 120 F. The D_2O pumps must be designed for essentially zero leakage because of the high value of the heavy water. The material used in the moderator piping system is aluminum. Other items associated with the moderator circuit include a gas-recombiner and gas-recovery unit, suitable heavy water treatment facilities (for maintaining necessary purity), a degasifier and a surge tank. The total inventory of heavy water is presently estimated at 80,000 lb. A more detailed economic study is required to design the various components of the system for the most economical inventory in terms of fixed and operating charges.

The thermal shield comprises 6 in. of iron, suitably ventilated, and a layer of material containing boron surrounding the reflector. The primary shield surrounding the reactor is completed by 8 ft of ordinary concrete. Penetrations through the concrete are held to a minimum. A study of construction costs reveals no economic advantage favoring the use of high-density concrete.

Steam produced by the steam generators is utilized in a tandem-compound, double-flow, 1,800-rpm turbine having a maximum capacity of 125,000 kw. The report goes on to show that the power plant would be of conventional design. As for operating personnel it states: The number of operating personnel will be high for the first dual-purpose reactor. The estimated requirements to man all shifts are: Reactor plant—operation, 46; health physics, 16; technical services, 13; security, 22; administration, 6; total 103. Power plant—operation, 14. Total operating personnel, 117.

Liquid-Metal-Cooled Dual-Purpose Fast Reactor

The fast reactor not only has advantages for a dual-purpose installation, but it also appears to have considerable promise for the ultimate nuclear power industry. This reactor differs from the water-cooled thermal type in several respects:

1. Since this is a fast reactor, there can be no materials of low atomic weight to moderate or slow down the neutrons. Therefore, water cooling is precluded, and low-pressure liquid-metal cooling is indicated.

2. Since all materials have much less tendency to absorb neutrons at fast energy levels, the choice of structural materials is less limited. Stainless steel appears to be entirely suitable for use in this reactor.

3. Because of the differences between certain nuclear constants for thermal and fast neutrons, the exposure time can be lengthened and fuel-handling costs correspondingly reduced.

4. This reactor produces more fissionable material than it consumes. It is based on the KAPL breeder.

Future improved designs could be substituted without altering the basic arrangement of the plant. The reactor core of highly enriched material is surrounded by a breeder blanket composed of either depleted or natural uranium. More than 90% of the heat production takes place in the core. The core consists of an assembly of a large number of stainless-steel fuel elements. A reflector probably will be used to envelop the core, serving to decrease the critical mass and also to limit the heating outside the core.

All the above are contained in a cylindrical steel vessel approximately 8 ft in diameter and 8 ft high. Provision must be made in the vessel for the circulation of liquid sodium, for access to permit refueling, and for the control mechanism.

Heat Exchange

Heat is removed from the reactor core and blanket by liquid sodium flowing at high velocity (approximately 30 ft per second). Circulation is maintained by two electromagnetic pumps. Primary coolant is pumped to two intermediate heat exchangers, entering them at 900 F and returning to the reactor at 600 F. Heat is transferred from the primary coolant to an intermediate coolant, which is also sodium. This intermediate coolant is circulated by electromagnetic pumps to the steam generators.

The intermediate heat exchanger can be of normal single-tube construction since leakage of sodium from the intermediate circuit to the primary will not affect reactor operation.

Secondary-coolant sodium entering the steam generators at 850 F produces superheated steam at 500 psig and 750 F. Two steam generators are required, each producing 800,000 lb per hour. They each consist of a steam drum, evaporator and superheater section. Steam is delivered to the turbine throttle at 485 psig and 750 F. The steam generator is also of single-tube construction since both sides are operated at full boiler pressure and since any mixing of sodium and water, which might result from a small leak, will not endanger reactor operation.

Steam is delivered to a single large turbogenerator of 154,600 kw maximum capability. It is a tandem-compound unit operating at 1,800 rpm. Although a relatively low-pressure installation, this unit operates on a conventional regenerative cycle with four extractions for feed-water heating.

Control can be effected either by moving a reflector located between

the core and the blanket or by altering the disposition of fertile and fissionable material. Either method can be accomplished by the use of control drums, incorporating in their most reactive positions all the elements of the normal blanket (and reflector).

Time Required

In general, it is important to recognize that the liquid-metal-cooled fast reactor cannot be considered equal to the water-cooled thermal reactor on the basis of applicable existing technology, time required for design and construction, reliability of cost and performance estimates, or safeguards and degree of isolation now required.

It is estimated that an additional two years will be required to complete a fast reactor installation, compared to a water-cooled thermal reactor. This time could possibly be reduced at the expense of additional and parallel development work.

The outstanding advantage for a liquid-metal-cooled reactor, as contrasted with one that is water cooled, is the possibility of improved steam conditions. For the present fast reactor design, a conservative throttle steam pressure of 485 psig and a temperature of 750 F have been selected. Test results to date have not revealed any limitation on the temperature of liquid sodium, and with further development and operating experience it appears entirely feasible that coolant temperatures may be increased to a point where steam at 1,000 F is obtained.

Economic Studies

Estimated Costs—Capital costs for each of the two dual-purpose reactors, exclusive of fuel fabrication and chemical plant facilities, have been estimated from the conceptual design of the reactor and power plant. All costs have been estimated on the basis of June 1952 rates and prices.

Operating Costs—Estimated operating costs are given in Table II.

Reactor Operated for Power Production Only—Three brief cost studies based on the liquid-metal-cooled fast reactor have been made to obtain a measure of the economic feasibility of nuclear power. They are designated cases I, II, and III, and the results are tabulated in Table III.

Examination of the data presented in Table III indicates (case I) that atomic power from an immediately feasible nuclear power plant cannot compete with power from conventional steam-electric plants now being constructed. Even with an amortization period of 20 years, which does not seem presently justified, the cost of such atomic power would be on the order of 12.5 mills per kilowatt-hour, whereas a conventional plant can produce power at 6 mills per kilowatt-hour. The cost of power of 3.6 mills per kilowatt-hour shown in case II, which assumes capital costs of the plant have been amortized, indicates that such a plant would have substantial value as a power producer after retirement from plutonium production. Case III indicates that a future atomic plant might produce power on a competitive basis with conventional methods.

Power Plant Economics—There are certain improvements in thermal efficiency which could be attained by refinements in the design of the turbo-generator plant and would result in reductions in the cost of plutonium, the magnitude of which becomes increasingly important as the economic life of the project is extended.

Because of the uncertainties connected with the initial dual-purpose plant and the desire to minimize capital costs, it is considered preferable not to take advantage of such refinements in the first installation. In any actual design, however, when the reactor operating conditions have been established, detailed analyses should be undertaken to determine the value of cycle refinements. In connection with a project for power only, on a long-term basis, these considerations would be of greater importance. It is noted that refinements in the power cycle of a conventional-fuel electric plant are paid for by the savings in fuel cost. For a nuclear power plant, in which fuel costs are one-third to one-half of those for a conventional plant, the capital expenditures which can be justified on the basis of fuel savings are correspondingly less.

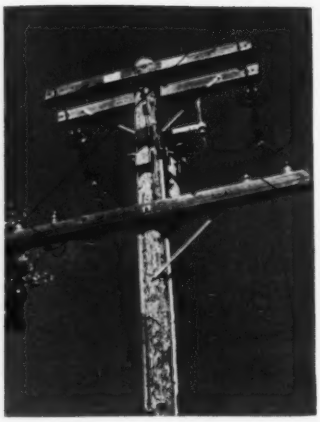
Table III

Economic Aspects of Power Production Only, Sodium-Cooled Fast Reactor[1, 2]

Data	Cost, Millions of Dollars				
	A	Case I	Case II	Case III	B
Reactor and power plant capital:					
Site and yard improvement	2.8	2.8	2.8	1.1	.5
Reactor plant	33.1	33.1	33.1	16.6	.....
Power plant	15.1	15.1	15.1	12.1	13.5
Total capital	51.0	51.0	51.0	29.8	14.0
Annual capital costs:					
Site and yard improvement	.36	.36	.....	.15	.....
Reactor plant	4.50	4.50	.....	2.26	.....
Power plant	2.05	2.05	.....	1.65	.....
Total fixed charges	6.91	6.91	.....	4.06	1.90
	.....	(6.8)	.....	(3.6)	(2.9)
Annual operating costs:					
Reactor operation and maintenance	1.06	.74	.74	.37	.....
Power plant operation and maintenance	.46	.46	.46	.35	.....
Total operating cost	1.52	1.20	1.20	.72	.40
	.....	(1.2)	(1.2)	(.6)	(.6)
Annual fuel costs:					
Fuel (incl. inventory and chemical processing	10.38	4.60	2.50	1.50	1.67
Total fuel cost	10.38	4.60	2.50	1.50	1.67
	.....	(4.5)	(2.4)	(1.3)	(2.5)
Cost of power:					
Total annual costs	18.81	12.71	3.70	6.28	4.00
Net capacity, megawatts	145.0	145.0	145.0	160.0	100.0
Net output, million kwh	1,020.	1,020.	1,020.	1,120.	667.
Cost, mills/kwh	.....	(12.5)	(3.6)	(5.5)	(6.0)

[1] A, operation of the dual-purpose reactor as currently conceived for power and plutonium. Case I, operation of the dual-purpose reactor as currently conceived for power only. Case II, operation of the dual-purpose reactor as currently conceived for power only after a 5-year amortization. Case III, future improved reactor built for power only. B, conventional steam power plant.

[2] Figures in parentheses are the costs computed in mills per kilowatt-hour.



Indicator board, line coupling capacitor and pole-mounted modulator, respectively, used in rural line outage monitor under test

Electronic Line Outage Monitor

Loss of power is shown by audio tone indicators operating from modulated carrier signal superimposed on distribution system

R. L. Brinton and C. E. Comstock
Pacific Gas and Electric Co.
San Francisco

Electronics has now come to the aid of the rural customers. Continuous monitoring of distribution lines enables the power house or substation operator or service dispatcher to identify immediately the distribution circuit in trouble. In isolated areas that do not have telephone service, customers sometimes have to drive five to ten miles to get to a telephone to report power outages. With the line outage monitor, service can sometimes be restored before the trouble is reported.

Pacific Gas and Electric Co. now has a line outage monitor in service on a 12-kv distribution line in the San Joaquin Division on an experimental basis. It is proving to be a real aid to further reduce outages to rural line customers. Although this system has been manufactured and experimented with in the East, this is the first installation of its kind in the West.

The line outage monitor is an electronic device functioning much as a carrier current supervisory system. However, in this system, each audio tone represents a different branch of the distribution line. These tones modulate a carrier transmitter which transmits the signal to the substation one mile from Kerckhoff power house. Here, a carrier receiver detects the signal and the resulting audio frequencies are passed on to the indicator unit in the power house control room. The indicator unit has ten pairs of red and green lights. Under normal conditions, the green lights are lit. Loss of audio tone causes a change from green to red light and a bell alarm, indicating the failure of a branch off the main 12-kv feeder circuit.

Modulator Units

The modulating units are located at various points on the distribution system that are to be monitored for outages. The modulator is one of the novel components of the system. It consists essentially of an inductance capacitance series circuit in which the Q of the inductance is varied at the audio rate, thus varying the carrier impedance across the line at the point of modulation. Each modulator sinusoidally alters the impedance of the distribution line at a predetermined rate. This resulting variation in impedance reflects back to the transmitter which superimposes the desired audio tone on the carrier transmitter.

The unit contains only three tubes and is compact enough to fit into a standard weatherproof electric meter housing and plugs into the meter socket mounted directly on a distribution pole, as shown. The socket contacts are connected to the 12-kv line through a specially designed 0.002 microfarad oil-filled coupling capacitor. This capacitor, pole mounted, is similar to the unit designed for the Bell System rural subscriber power line carrier telephone service.

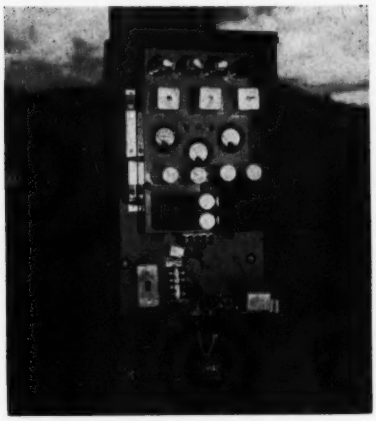
The transmitter and receiver are typical carrier equipment. The transmitter output is 25 w and its frequency can be varied from 50 to 150 kc. The receiver has a tuned radio frequency front end with about 1.5 w undistorted audio output.

Indicator

The indicator is the other novel component of the system. It consists of an amplifier and power supply and separate channel indicators responsive to each modulator frequency. The input from the main amplifier is fed into a cathode follower, coupled into a vibrating reed acting as a band-pass filter. This reed is highly selective to its own resonant frequency and passes the signal tone to its output circuit. The control tube is biased to cut-off and will conduct only when a signal from the vibrating reed is available.

In this condition, the relay contacts energize a green panel light indicating normal operating condition. Loss of modulating signal stops vibration of the reed band-pass filter and causes the relay contacts to switch from green to red light, indicating a power failure on the branch circuit on which the modulator is located. A failure of the main feeder circuit on which the transmitter is located will cause all lights to change from green to red.

The modulators are installed on convenient transformer poles on the



Transmitter superimposes carrier on the line

load side of the monitored device. In general, transmitters, receivers and modulators are installed in spots conveniently located for easy access. Distribution taps and branch circuits, whose effective lengths are odd multiples of one-quarter wave length, present the biggest problem in installing the system. They tend to act as low impedance bridging circuits. In some cases, it was found necessary to shorten, lengthen or isolate these taps effectively by inserting choke coils or by installing a termination unit. Distribution transformers and lightning arresters introduce discontinuities in the line, but the attenuation of the carrier signal is not significant.

Operating Results

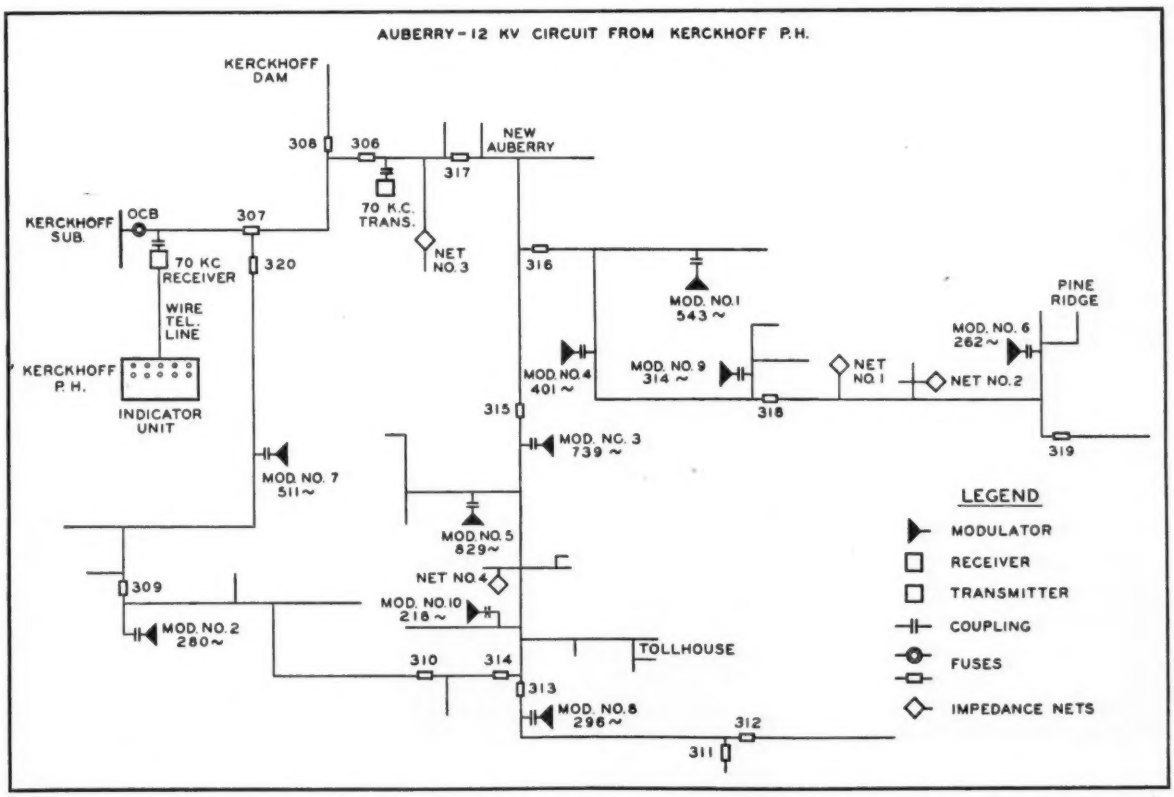
A log has been kept giving operating details of the system over a period of about eight months. Seven line outages occurred during the period. Only one outage was on the main feeder circuit causing all the lights to turn red. The other six were on one or more of the branch circuits.

In six of the cases, it was estimated that at least three to four hours per outage were saved in restoring service. In the seventh case, the fuses blew on an isolated tap line at 8:34 p.m., Sunday. Service was restored to normal by 10:36 p.m. Had there been no indication of the power outage from the line outage monitor, it is doubtful whether a *no power* complaint would have been turned in before morning. Consequently, normal service might not have been restored before 9 to 10 o'clock Monday morning, resulting in considerable customer inconvenience and loss of revenue to the company.

Many Uses

Although there are still further improvements to be made in the equipment, there is no doubt that there will be considerable demand for the line outage monitor when it becomes available commercially. Applications other than to rural line and distribution circuit monitoring immediately suggest themselves. For instance, the system can well be applied to indicate outages on important customers such as radio stations and hospitals; it could be used as a fire alarm system on rural lines; it is equally adaptable to lines of higher voltage than the conventional 12-kv class; it can constitute an economical supervisory system since the operation of reclosing breakers, three-shot fuses and other equipment is instantly indicated. A logical application would be the indication of abnormal temperature on small rural transformer banks.

The present equipment, manufactured by the Sprague Electric Co., is a shop model. Preproduction equipment will replace existing equipment this coming fall on the PG and E installation. Production line equipment is scheduled for delivery early next year.



Schematic diagram of experimental installation of Sprague Moduline line outage monitor applied to 12-kv rural distribution system

Crowds at the Sacramento Electric Show

Above, center, one of many lighting and wiring exhibits in the contractors' division hall at the San Diego Spring Fair. Typical of action during its phenomenal run was this appliance area scene just above. Total attendance was 135,000 people at the exhibit

Show Time

Whether large or small, with or without high-priced entertainment, free or with paid admissions, the past three months have certainly been show time for electrical appliances throughout the West. In British Columbia and Montana the power companies toured the farm regions with home and farm shows to packed small town halls. San Diego Bureau of Home Appliances staged its ninth annual Spring Fair for free to some 135,000 people, filling four large fair exhibit buildings, and including a building full of home wiring and lighting materials and methods. In Phoenix the Appliance Merchandisers Assn. plunged into the early air conditioning season there with a combined air conditioning and appliance show, which also was simultaneous with a flower show in an adjacent state fair building. Sacramento Valley Electric League packed the municipal auditorium for its second annual electrical home show using the "Great Gildersleeve" and other TV stars as attractions.

Others combined with home shows and food shows staged by other managements. Appliances played a prominent part in the Los Angeles Home Show at Pan Pacific Auditorium, June 4-14. In Salt Lake City, Utah Power & Light home economists participated in a *Salt Lake Tribune-Deseret News* cooking school for 7,600 women; and in Logan, Utah, 12 dealers, the Intermountain Electrical Assn. and Logan

Ample space later crowded at Phoenix show

in the West

Herald-Journal staged a two-day electric appliance fair at Utah State College. In northern California the units of Northern California Electric Bureau have been engaged in cooking schools, a home show in Marysville and in Oroville, a flower festival and a carnival in Lincoln. The Peninsula Appliance Dealers Assn. is planning a large exhibit at the San Mateo County Fair Aug. 14-22; the Yuba-Sutter Gas & Electric Appliance Assn. in the Yuba-Sutter Fair; the Santa Cruz-Watsonville association in the Santa Cruz County Fair at Watsonville. Other county fairs throughout the West and from now 'til fall will also find appliances a dominant part.

Sacramento had 13,886 attendance for its four-day show, double last year's. Phoenix attendance was estimated at 25,000 in a four-day show. On the whole the sales results were highly satisfactory. In some of the combination home shows, dealers sometimes expressed disappointment over sales. In San Diego J. Clark Chamberlain, bureau manager, said that the show had put new hope into the salesmen when they saw the interest the public displayed, and this spurred them to get out of a selling slump. Similar opinions were expressed in Sacramento by Bob Moore, who managed the show for the league. More than anything else the shows helped to bring white goods back into the public eye—away from TV a bit.

In center above, Reddy Kilowatt proved a constant attraction to the youngsters at the Phoenix Air Conditioning and Appliance Show. Bill Cowdry, AMA manager, shown just above during one of the prize drawings. A flower show next door added to the event

Kaye Leighton, Marguerite Fenner, Myrtle Fahsbender conducted an institute to help . . .

Teachers See the Light

There's hope for home lighting. Two of the nation's most illuminating women on the subject of home lighting, Myrtle Fahsbender of Westinghouse and Kaye Leighton of General Electric, in a five-day workshop put 101 teachers through a concentrated course in San Francisco, June 15-19. It was the first time in the West such a course had ever been offered, and perhaps the first in the U. S. where one unit of upper division college credit was given those taking the course.

This Home Lighting Workshop was jointly sponsored by the San Francisco State College (which afforded the college credit), the Illuminating Engineering Society, Northern California Section and the Northern California Electrical Bureau. It was engineered by Marguerite Fenner, director of home economics, and John S. Walsh, illuminating engineer, of Pacific Gas and Electric Co. with the assistance of Gertrude Luehning, chairman of the department of home economics at San Francisco State College.

One hundred and one teachers took advantage of this unusual opportunity, registered for the course for credit on Monday morning and attended morning and afternoon meetings every day during the week. These included teachers in elementary schools, junior and senior high schools and several colleges. There were teachers of homemaking or home economics, commercial subjects, social studies, health and physical education, art, science and the industrial arts.

Total attendance at the meetings, which were held in the Pacific Gas and Electric Co. auditorium at 245 Market St., went up to 190 before the week was over. All meetings were open and there was no fee unless credit was desired, so a great many persons who were not able to attend every day did come to some of the meetings. Included were representatives of the Agricultural Extension Service, interior decorators, lighting retailers, and utility personnel. Representatives of utility companies in Arizona, San Diego and Portland came to San Francisco particularly to attend the workshop. There were also a generous number from the PG and E, including districts outside the Bay Area.

In the course of the week, every aspect and detail of home lighting was discussed by experts. For example, on the first day Paul Schmidt of General Electric Co. told about all the different types of light bulbs and tubes, the sources of light for the home, showing and demonstrating most of them as he talked. In later meetings, these light sources were shown used in many different ways to provide light for every need in the home. John Walsh, chief illuminating engineer of PG and E, spoke on "Light and Color" and gave an impressive demonstration of the effect of incandescent light and various types of fluorescent light on different colors in fabrics, wall surfaces and foods. W. T. Kennedy, Kennedy Electric Co., a San Francisco contractor, told of the need for adequate wiring to obtain adequate lighting.

The two main speakers at the workshop were Miss Leighton, residence lighting specialist with the Lamp Department, General Electric Co. at Nela Park, Cleveland, and Miss Fahsbender, director of residential lighting, Lamp Division of Westinghouse Electric Corp. in Bloomfield, N. J. Both are nationally known authorities on home lighting. With the help of slides and demonstrations, they discussed all types of portable lamps and how they should be used; solutions to specific lighting problems such as light for reading in bed, for hand and machine sewing, for piano playing and televiewing; various kinds of built-in lighting; and lighting for special decorative effects.

Equipment with which to illustrate the ideas discussed was loaned by a number of lighting equipment distributors and manufacturers. The recent movies produced by the lamp companies were shown and a package of literature pertaining to home lighting was presented to each one who registered.

One of the most encouraging reactions to the information presented was the lively interest aroused and demonstrated by the type and sincerity of the questions asked both Miss Fahsbender and Miss Leighton in every session.

Colorado Range Drive

Both electric and gas ranges have been made the feature of a three-month drive in various divisions of the Public Service Co. of Colorado from May through July. This is a direct-sales program by the company with company personnel making the sales, although dealers are invited to tie in if they wish. In competitive territories, both electric and gas ranges are sold. A quota of 600 was set for the three-month period. Promotion, besides newspaper advertising, consisted of a series of cooking demonstrations in the divisions, towns and villages where the aim was to meet with groups of customers in numbers of from 50 to 100. This type of program has been successful before, said P. E. Brookover, who heads the division sales.

ELECTRICAL WEST Sales Guide

News Letter

July 1953 ©

FOR THE ELECTRICAL MERCHANT OF THE WEST

Man, dig this crazy appliance business! It has more phantasies than a hophead's dream--discount dementia, backdoor blues, trade-in tremens, fold-up follies, credit constipation, overproduction obsession, distribution dysentery and just plain old customer caution. You can't blame the customer, seeing all this chaos, for thinking he'll get a better bargain if he lets the appliance and TV industry collapse so he can pick up the pieces he wants. This seems to be the shakedown.

Screaming meemies

Probably the sanest answer to it all was given at the National Appliance & Radio-TV Dealers Assn. by Harry Alter, a Chicago distributor, June 30, when he predicted a shakedown of manufacturers, distributors and dealers would end in full-line exclusive dealerships with real territory protection. Right now it's "survival of the fittest."

Tight answer

But why dwell on gloom when there's selling to be done. The auto business is just as dizzy, if that's any consolation. Better to team up on some of the constructive activities ahead than flounder in a price and discount free-for-all. In that direction survival lies.

Accentuate positive

Buying was awfully cautious at the Chicago market in late June, but maybe that is better. Two Western markets are coming up--that in Los Angeles, July 13-17; and the Western Summer Market at Western Merchandise Mart, San Francisco, July 20-24. Then later the Western Gift, Toy and Housewares show will be at the same Mart, Aug. 2-5; then goes to Portland Aug. 9-12, Seattle Aug. 16-19 and Spokane Aug. 23-25. In Los Angeles, the 5th Western Housewares Show will be at the Biltmore Sept. 20-23.

Markets

Significant of the times is the program of speakers for the Western Radio-TV and Appliance Trade Dinner at Western Merchandise Mart on Wednesday evening, July 22. Mrs. Muriel N. Tsvetkoff, manager of the San Francisco Better Business Bureau, and Dr. Alfred P. Haake, famous lecturer on economics, will be speakers and W. I. Buchanan, Frigidaire regional manager, will be chairman.

Tuned to times

Managers of these electric leagues and associations, which organize the industry into selling campaigns, shows, promotions and training programs for sales, will gather in San Francisco's Fairmont for the 18th annual conference of the International Assn. of Electrical Leagues, the first ever held in the West, from Aug. 5-8. Anyone in the appliance business interested is invited to the open sessions, at which previews of national promotional programs will be given.

Chiefs of staffs meet

When you turn your eyes away from the ads screaming price cuts to actual sales figures, things haven't been too bad. Hot weather arrived and created a market for room coolers in many parts of the West. Freezers are doing well. Thanks to the housewares' promotions, new spurts of interest have been reported in table appliance sales.

Not so bad

These business-building business things are going on: Throughout Northern California Electrical Bureau territory "Operation Switch" is on to promote sales of new electric ranges to replace old and slow models and as many as possible of the 65,000-lp gas ranges now being used. Every lpg user is known and carded and receiving three testimonial letters from former lpg users who have switched to electricity, learned the economy of the electric way. Business-reply cards make a list of prospects that are turned over to dealers. . . San Diego's Bureau of Home Appliances is carrying strong ad promotions of refrigerators, freezers and electric housewares gift program, electric range and air conditioning campaigns. To train salesmen for today's competitive situation it has two courses, one on major appliance selling, the other creative selling in today's market; for dealers and management, one on "How to Make a Profit from the Appliance Business" and a brand new course for dealers and service managers on customer relations. Plans also are shaping for the 16th annual Electrical Show Nov. 27 to Dec. 3.

Bandwagons to climb on

El Paso Electric is launching a brand new program of cooperation with authorized Reddy Kilowatt electric appliance dealers and appliance-of-the-month promotion, many helps and incentives. . . Appliance Merchandisers Assn. in Phoenix and Arizona Public Service in other parts of Arizona have strong refrigerator and food freezer promotions going as well as a houseware campaign and sales are up 20% above 1952. . . Coast Counties Gas & Electric Co. is carrying on a freezer promotion. . . Freezers and room air conditioners are being promoted heavily in Inland Empire newspapers by Inland Empire Electric League and Washington Water Power along with store shows and demonstrations, dealers' sales force training. The league also is preparing an outline of future promotions so that manufacturers can tie in their programs with local activity. It reports a 41% gain in appliance business on unit sales for the first five months of 1953 over 1952. . . Intermountain Electrical Assn. has just been carrying on a strong housewares promotion. . . And every manufacturer is doing more advertising nationally than ever before.

...and ride

F. B. Connelly Co. of Oregon, Norge distributors, broke the news of the new Norge dryer with fanfare late last month, combining a six-column spread in the Oregonian, dealer dinner meetings, half-hour radio audience-participation quiz show and a direct-mail campaign.

Splash

The electrical industry will have a building of its own in the Pacific National Exhibition at Vancouver, B. C., beginning this year. Previously electrical exhibitors had to be scattered throughout the various buildings. The show dates are Aug. 26 to Sept 7, and B. C. Electric plans to have three stages promoting kitchen, living room and utility room electric living and light conditioning.

Electric exhibit

Silex Co. has bought the Chicago Electrical Mfg. Co., makers of the Handyhot line. . . And Voss Bros. Mfg. Co., oldest washing machine manufacturer, sold to Midwest Metal Stamping Co. of Kellogg, Iowa. . . Hamilton Mfg. Co. launched an automatic washer for the first time in its 73-year-old history and will also have wringer-type washers. . . Easy Washing Machine Co. has at last come out with its long-expected automatic.

In the east

Filling the gaps

More TV stations on the air: Fresno's KMJ-TV was connected to the telephone system's network soon after going on the air. . . Pueblo's KCSJ-TV began test patterns late in June and will soon be programming. . . KONA in Honolulu went back on the air after having stopped. Eddie Cantor and a group of stars from the Mainland initiated the renewed broadcasting. . . Boise's KIDO-TV is scheduled for July 12. . . In Butte KXLF-TV, channel 6, expects to put test patterns on by August 15. Its studio is complete and transmitter almost. . . KOOK in Billings promises filmed TV by Sept. 1. . . Yakima expects its station to be on the air toward the end of July. . . Tucson's KDOA expects to be televising by Sept. 15. A TV fair was held there recently for 25,000 persons. KOPO-TV in Tucson expects coaxial cable connections by Oct. 1. . . KSWS-TV at Roswell, N. M., was the latest station to open in that area over channel 13. . . British Columbia has been promised a station by Canadian Broadcasting Co., the government-owned network, by the end of 1953. Private owners have petitioned for licenses but won't be granted any by the bureaucracy until the government system has stations. There are about 9,000 sets already, receiving from Seattle and Bellingham.

Low price specials

Difficult to keep up with all the new models and changes but here are a few. . . Motorola shortened its line to 20, keeping its price range from a 17-in. at $179.95 on up but giving longer dealer discounts. Also featuring higher fidelity sound. . . Emerson claims "lowest price" 17-in. table model at $199.95 with all 82 channels. . . DuMont's receivers start at $199.95 for a table model in wood. . . CBS-Columbia increased distributor and dealer margins on 21-in. promotional models. . . When Ross Siragusa met with distributors of Admiral in San Francisco, a promotional model 17-in. at $159.95 was introduced. Also shown was a de luxe high-fidelity radio-phonograph alone. . . Magnavox has a full range high-fidelity four-speaker phonograph for less than $200, as well as 24- and 27-in. TVs. . . Packard-Bell is offering all former owners of small screen sets a radio-clock on the purchase of a 21-in. or larger model.

Back in harness

Surprising news in the washer field when Louis D. Stull, for 10 years Western division manager, Apex Electrical Mfg. Co., went to Cleveland as national sales manager and A. C. Scott, vice-president, formerly from the West, appointed Fred S. Fenton Jr., who only recently retired as Easy district manager, to be Apex Western division manager.

Shifting lines

Distributor changes and expansions include these: Keith Auto Supply Co. of Billings, with branches in other Montana and Wyoming cities, has been named distributor by Emerson Radio & Phonograph Corp. . . Speed Queen has franchised Von Hamm-Young Co. as distributor for the Hawaiian Islands. . . F. B. Connelly Co. of Oregon has been made distributor for both Sunbeam Inc. and General Electric Co. electric housewares. . . Century Distributing Co. in Denver resigned as distributor for Kaye-Halbert TV. . . Horn & Cox Inc. has taken on the line of Arvin Radio, table line only. . . Gough Industries, according to George Porter, district manager, moved its San Diego quarters to 5252 Landon St. American Central line of kitchens will now be distributed by them. . . Graybar Electric is now distributing Raytheon TV in San Diego County and Imperial County. Robert Van Epps, who was with Raytheon, joined Graybar. . . Kaemper & Barrett moved to a new location at 233 Industrial St., San Francisco. Clyde Allen Co. has taken on Ryan Freezepantries' line of freezers for California, Nevada, Arizona, New Mexico and El Paso; and Scott and Meck television for northern California. It has Mirratone also, made by Meck, and the St. Johns Mfg. Co. line of television tables and cabinets. It is enlarging its space in the Western Merchandise Mart.

People change

Men make this news: Changes in the Salt Lake City district G-E Supply office made by R. S. Belknap, district manager, to fit in with the new appliance and electronics distribution, are: W. B. Roberts from radio and traffic appliance specialist to district sales manager, radio-TV and traffic appliances; R. R. Strachen from manager of advertising and sales promotion to district sales manager, major appliances, E. M. Boggess from coded salesman to district radio and TV specialist; R. F. Paasch from Boise branch sales manager to advertising sales promotion manager; R. M. Read, sales promotion supervisor. Earl B. Mathews was made appliance sales manager at the Boise branch. . . Hal Shafer has been made regional manager for Eureka-Williams Corp. in the Northwest. He was formerly from Sunset Electric and had Shafer Distributing Co. in Seattle. . . F. K. Grider announced the appointment of G. G. Geoffroy as sales manager of the Pacific Co. Ltd., Motorola distributor in Hawaii. . . Cecil H. Boyd appointed Ernest Hughes as plant superintendent of Boyd Distributing Co., Denver. . . Patrick F. Koughan has been named to a new position as Pacific Coast district advertising and sales promotion supervisor for Westinghouse Radio-Television Division. . . In Vancouver, B. C., Don Mainwaring, formerly Western representative for Philco, opened a new distributorship known as Wholesale Appliances Ltd. . . Berkeley L. Fuller has been made northern California factory district manager for Hoffman Radio Corp. and Frank P. Fern is field sales supervisor, a new position. He was formerly with Horn & Cox Inc. . . John Lyons resigned as distributor sales manager for Kaye-Halbert TV to enter his own business. . . Before moving into the new headquarters, Phil Gough, Gough Industries, made S. T. Bell, a company vice-president, the general manager of the appliance division and William Pomeroy assistant general manager and operations manager; James Moore sales manager of major appliances; L. Matson Bocker sales manager, small appliances; and Dean Herrick manager of vacuum cleaners. Albert Hall is manager of branch operations. . . David G. Bryant was made northern California district radio-TV sales manager for Westinghouse Supply. He was with Central Electric Appliance Co. in Palo Alto. . . Keith Carpenter, formerly with Savage & Sons, Denver, has been made retail sales development representative by Servel. . . Allan B. Pontius, formerly with Leo J. Meyberg Co., has joined Billings Wholesale, Admiral distributor in Fresno. . . James P. McMahon has been made merchandise manager, a new position, with Thermador Electric Mfg. Co. . . Anthony Celio has been appointed by E. A. Lindemann, president of L & H, as sales promotion manager. A native of Utah, he transferred from a Western wholesale distributor. . . Betty Smith is the new Oakland branch home economist for Frigidaire.

On their own now

Carter-McIlroy-Johnson Inc. at 4747 25th Ave., N. E., Seattle, is a new wholesale TV and major appliance distributor, formed by three former Harper-Meggee officers, E. Stewart Carter is president and general manager, B. C. McIlroy vice-president and general sales manager, and W. R. Johnson vice-president and treasurer.

New setup

Kaye-Halbert has moved its San Francisco headquarters to Western Merchandise Mart, taking the space formerly occupied by Raytheon Co. It has also appointed East Bay Television Service at 5795 Foothill Blvd., Oakland, as northern California parts and service agency.

Big Seattle pow-wow

First sales conference of its kind in the Northwest is being planned by Northwest Appliance & TV Assn., together with NARDA at the Norselander Hotel, Seattle, Sept. 27-28. Following a reception on Sunday, business sessions will start with a breakfast at 8, presided over by Keith Davis, president, and a number of thought-provoking talks followed by industry forums.

Admiral Meets The Press

Admiral's spectacular president, Ross D. Siragusa, and Wallace C. Johnson, vice-president—sales, personally headed a troupe that previewed the 18 new television models, six radios and a brand-new 15-tube high fidelity AM-FM radio-phonograph (without TV) that the company is springing. The occasion was the last of three distributors meetings, this one in San Francisco, June 5, after others in New York and Chicago.

What the press wanted to know from Siragusa was when color TV would be here. With a laboratory in Palo Alto busy on color and other electronic research, which he would not divulge but said was not military, Siragusa declared that, until color tubes could be produced for less money, color TV on any but experimental scale would be slow coming, two years at least. As it is the tube alone now costs as much as the entire 17-in. receiver sells for and so far only a 12½-in. frame from a 16½-in. tube has been available.

But let no one think anyone is holding back color TV for commercial reasons, he said. The replacement market color would make is so tremendous that every TV maker is anxious to get into it.

Eying the surprisingly large market for high-fidelity sound alone, Admiral will introduce a super - high - fidelity AM-FM radio-phonograph combination. Siragusa and Johnson brought a model along and demonstrated it. What price it will sell for had not yet been decided, but it will be strictly in the upper brackets.

Admiral's claim to be No. 1 in the TV field of sales has not been challenged with facts and figures, Siragusa said. And to maintain it the new line shown Western distributors included an economy model 17-in. table receiver to sell at $159.95, $40 less than competitive models, and a 21-in. at $199.95. Its step-up from model to model is well made and the 21-in. is the best seller, with the 24-in. coming along. In six months Siragusa promised a budget priced 24-in. set at $399.95.

The white goods line was not shown at this meeting, although distributors show it along with the radio and TV to their dealer open house gatherings. Admiral has the Dual-Temp refrigerator, a freezer, electric range and a line of window air conditioners and dehumidifiers. But Siragusa said he had no intention of getting into the laundry equipment business. "We have enough balls in the air now," he answered. He did say that West Coast sales of the company's products were a sixth of the national total although population here is only a tenth.

Siragusa Johnson

Representatives of these Admiral distributors in 14 Western states attended the meetings at which Siragusa and Johnson spoke: Columbia Distributing Inc., Seattle; Lou M. Johnson Co., Portland; Admiral's own distributorships in San Francisco, Los Angeles and San Diego; Harry Billings, Fresno; Walter B. Lloyd Co., Salt Lake City; Arizona Hardware Co., Phoenix; Cunningham Sales, Albuquerque; Iron Sales Co., El Paso; West Texas Supply, Amarillo; Allied Appliances, Denver; and Berebeth Sales Co., Honolulu.

Seattle's Big Tanks

Commercial electric water heating is growing fast in Seattle as equipment has been designed and produced locally to meet this new opportunity. Seattle City Light has a promotional rate of ¾c per kw with a control of $1.50 per kw as a minimum. For over a year there has been available a 100-gal tank with up to 15 kw arranged either in three 5-kw elements or six 2½-kw elements. This gives quick recovery and likewise distributes the peak demand. Recently there was produced a 50-gal tank with 7½ kw on the basis of 150 w per gal of heating capacity. For even larger installations there was still needed a larger tank. Now a 175-gal tank, 28-in. wide, which will go through a 30-in. door, is being made with 15 kw in the bottom elements and 10 kw in those at the top. This gives 100-gal-an-hour recovery and can meet any hot water requirement where gas is used at present.

For commercial use in restaurants a 180° temperature is required by law. This can be maintained and the advantage of electric is that there are no flue requirements and no stacks necessary.

Another market fast developing is a 1½-gal tank under sinks with 600 to 750 w capacity. Many gasoline stations and rest rooms are using this individual unit.

Selling at Grass Roots

Addressed to its dealers, distributors, manufacturers of appliances, the architects and engineers and general contractors, the electrical contractors and plumbers and inspectors, California-Pacific Utilities Co., both in a series of meetings and with a well-prepared booklet, redeclared its grass-roots program of customer service and business development. Electric properties served by the company include Baker, Ore., district; Lassen district in California; Winnemucca, Nev.; Henderson, Nev., at both Hoover Dam and Needles, Calif.; Malad City, Idaho; and Cokeville, Wyo.

The booklet begins with a letter from the division manager in each case and one from E. A. Nickelsen, commercial manager, addressed to the company's associates in the electrical industry. The forepart of the book tells of the company's progress under free enterprise, how it has met demands for increased capacity, and constantly reduced rates. It also tells that the company gave up its merchandising franchises following the war because dealers have been able to maintain high sales quotas and have cooperated in promotional programs.

With the pent-up demand for appliances satisfied, it suggests for the future a more aggressive selling policy and sets forth the part that the manufacturer, distributor, dealer, architect, contractor, plumber must play and the policies that the company feels are necessary to observe. The company policies are set forth as to rural electrification and development, industrial growth, appliance selling, dealer neutrality, service neutrality, electric house heating, and the advisory services that it furnishes.

Clearly set forth is the company's problem of increased operating costs, taxes, wages, etc., which make a necessity for continued business development in order to maintain the present low rates. Only if dealers, distributors and other allies fail to maintain necessary growth rates is there any implication the company may go into other methods of promoting sales.

The number of successful meetings with dealers and contractors in all service areas brought general enthusiasm for the restated policy and pledges of cooperation to make it a success.

Ed Buck carries scenery, lighting and electrical magic props as Montana Power Co. . . .

— all packed into this gate-lift truck

Takes the Show to the Farm

In the wide open spaces of Montana there is only one way to reach the rural customers — go to them where they live. It is with this practical approach to a problem that besets many Western utility companies serving widely scattered farming areas that D. J. McGonigle, general sales manager of Montana Power Co., has launched a rural sales campaign to go right to the farm people of that state. It has many unusual features to it, all of which make it bring the results it is getting already after only two months of the campaign that still runs to Nov. 30.

What makes this campaign different are these points:

1. Every one of the 12,400 rural customers eligible was personally contacted, their major appliance needs listed and—

2. Instead of the dealer being given a bonus for the sale of certain selected load-building appliances the *customer* was given a coupon good for a worthwhile amount if used personally to buy an appliance not already owned, from whatever dealer he wanted.

3. Although many have sent out shows to promote the desire to buy none have ever concentrated so on the very small towns the way Montana Power is doing.

Montana Power's problem is similar to that of many Western companies. It serves a widespread area of some 90,000 square miles. Its investment in rural lines is heavy. It has only one residential rate, even for the customers farthest out on the lines. It needs a higher saturation of revenue-producing appliances in order to get a fair return on its investment. How was it to reach the 12,400 rural farm residential and rural village (250 population or less) residential customers to show them the advantages of using such modern appliances?

The company is no longer in the merchandising business. It depends upon the distributors and dealers for sales coverage. The dealers range from some very good, through many indifferent, to some poor ones.

Two years ago McGonigle tried another plan that was quite successful in standpoint of sales. It was directed to 6,000 strictly farm customers and resulted in the sale of an average of one major appliance to each six customers. In that campaign the dealers were given a bonus upon the sale of selected appliances.

While that campaign was a success in sales, it lacked what McGonigle feels is a necessary personal contact between the power company and its customers. For that reason, this time the approach is made through the customer, offering him help to buy the equipment from whomever he wants. To do this involves personal contact by Montana Power company personnel of each of these customers to leave with them numbered coupons good for any of the five items they do not already have. An additional one may be purchased but not a replacement.

The value of the coupons turned in to a dealer are: $25 on a range, $25 on a water heater, $10 on a freezer, $10 on a dryer, $10 on a pressure water system. Customers must be served directly by the company. Coupons are not transferable, and the appliance must be installed at the location on the customer meter record.

In buying an appliance with a coupon the customer endorses it to the dealer, who then presents it to Montana Power for redemption at full face value upon sale and completed installation of the appliance. The coupon is in quadruplicate, the original going back to the Butte office, the duplicate to the customer, the triplicate to the division office, the quadruplicate to the local town office. Conditions are stated on the back of the customer's copy, as well as a description of what is meant by each appliance.

"You wouldn't think you'd have to define what a range is, but you do," said McGonigle.

Ploughing the Ground

Advance preparation is thorough and important. Prior to launching the campaign, meetings were held with the distributors and manufacturers of equipment sold in the area to acquaint them with all details. At each division the staff held dealer meetings to acquaint them with the program and alert them to participating in it by making displays of their appliances wherever possible at each of the shows.

Before the home service advisor or company representative made a call, each eligible customer was sent a letter announcing the program. It told that a representative would call soon

to explain the unusual opportunity offered to assist them financially to buy any or all of the five major electric appliances that they did not already have. It was signed by the division manager.

Many customers phoned in or came to the office before the representatives got there. The response was excellent everywhere.

When the representative called and explained the proposition he or she filled out coupons for the specific appliances not already owned. These were left with the customer. The original went back to the office. At the same time an invitation was left to come see the traveling show, *The Room of Amazement*. This invitation gave the time and place it was to appear. All calls were to be made before May 1.

Following the calls a list of those contacted, their addresses, what appliances they possessed and what coupons were left, was processed as a prospect list. Copies of such local lists were then placed in the hands of all dealers for their own trading areas.

As a further help to dealers the company set up procedure to furnish mailing stickers to be affixed by the dealer to his own brand advertising literature. The only condition made was that the company be furnished a copy of what it was intended to have mailed from that list. This applied either to dealers, distributors or manufacturers who might want to follow up prospects with such mailings. Their cost would be that of postage only.

About 10 days before the show date at the nearest place a brochure was mailed to each customer inviting the whole family to the show. News stories and advertisements were sent to the local papers. Posters were displayed also in stores in each locality announcing it.

The show is still on the road—and will be until Sept. 4. It started from Butte, the complete show loaded on a heavy gate-lift truck, April 15, and will have covered 3,000 miles and played 57 performances. It came through the floods near Havre in May undamaged but damp, Montana Power says, although some of the buildings in which the meetings were held or in which Edwin R. Buck, show director, and his wife stayed were later damaged by floods.

The Show—Magic, Corn, Selling

Room of Amazement is a homespun blend of things that make a hit with the rural audiences. It was designed by Ed Buck, who last year did a series of Better Living shows throughout the territory, and by Mary Ann Gates, home service director of Montana Power. Assisting in each showing are local representatives of the new business department and the division home service advisor, of which the company now has eight. Mrs. Gates herself acted in several of the performances, then coached the other girls in the roles they play in the show.

At each of the 57 towns the show starts with an afternoon performance, which is a freezer and food preparation home service demonstration, designed to appeal primarily to women. The evening show is the one designed to sell. In it Buck does a "house of magic" type of electrical phenomena show, part of it at the opening, some between the acts.

To break the ice the first act, to sell the idea of a water system, explodes in a Hellzapoppin' style. If a few dishes are thrown and broken by Flossie, played by the home service advisor "dressed for pumping water at a well on a cold day," she does convince Clarence, played by a Montana Power residential representative, —as well as the audience—that buying an electric water pressure system not only will mean water for dishes, clothes, bathing, etc., but bring profit from having more water for the cows, chickens and farm needs, as well as provide fire protection.

In contrast the presentation on the electric range is done straight. That on water heating is introduced in costume—an old house dress, a white wig of a mop, a huge kettle of water on the range. The freezer presentation again is straight selling. So is that on the clothes dryer. Then Ed Buck closes the show with a spectacular black light demonstration.

To date the response has been phenomenal. The smaller the town the bigger the percentage of it comes to the show. In one, Carter, population is 104 and 212 attended the show. Hinsdale, population 416, had audiences of 81 in the afternoon, 253 at night, a total of 334. For the month of May in the 17 performances in towns with a total population of 15,769 the total attendance was 5,775, a third of the people.

Dealers and distributors have been delighted too. The response to an invitation to display samples of the appliances featured at each of the meetings has been enthusiastic.

First returns from dealers cashing in the coupons show that water heaters are the leading item of those wanted and purchased. McGonigle feels that the quota of 4,300 units—300 water systems, 1,000 ranges, 1,000 water heaters, 1,000 freezers and 1,000 dryers—will be exceeded before the campaign is through the summer. If so, the first year's revenue will pay for the entire sales cost of it. And the company will have done something far more tangible "for the farmer" than that of any politician.

Montana Power's new business department was given the go signal by J. E. Corette, president and general manager, early this year and the department is rebuilding in all divisions. To re-energize the whole idea of selling, a highly successful business development conference and home service workshop was held in the company auditorium in Butte in February. The executives of the company pledged their support and belief in such a policy and three days of conference recharged the entire personnel with driving power to go after business again.

Clarence Kommers, customer advisor, Lois Coleman, home service, enact water-system skit

ELECTRICAL WEST

Broadening the Young Engineer

IF management is to develop and utilize fully the talents and abilities of engineers, it must recognize the part played by the professional society in that development. A definite and constructive program for encouraging engineers to participate in the activities of appropriate societies is essential in any management development program. Three tangible benefits accrue from such an activity: (1) Professional and social recognition enhance the engineer's position. (2) His technical understanding and knowledge is immeasurably broadened. (3) The mental disciplines from committee activity and technical paper preparation are invaluable.

If the criterion of attendance at professional society meetings and conventions could be used as a measurement of management appreciation of the value of this activity to young engineers, then there is much to be desired. At recent national and regional meetings young engineers have been conspicuous by their absence. Oldsters—appreciative of the benefits and values of the widest possible professional contact—have been present in large numbers.

With management development one of the major problems of the day, no stone should be left unturned in stimulating and broadening the understanding and education of the young engineers who will be tomorrow's managers.

More Light on School Lighting

MANY architects and schoolhouse planners today are capitalizing upon the intensive sales work of the electrical industry's lighting engineers. By dint of years of hard selling the lighting men have established 100 foot-candles as the minimum standard for school rooms. Now architects are endeavoring to provide this intensity with free daylight.

They started with unilateral daylighting; then advanced to bilateral effects; and today the latest technique is dubbed skylateral. In this not only the walls but a portion of the ceiling and roof is glass. In their zeal to accomplish with so-called "free" daylight what was better accomplished by a combination of natural and artificial light, these planners have come up against a problem of brightness control that has teachers and pupils blinking and school boards worried.

Despite the research of the last few years, which has been somewhat biased in favor of daylight and glass, it is a fundamental fact that the ideal for good seeing is provided by a proper balance between daylight and artificial light. Only by such a combination can real brightness control be effected.

A research program to study the whole field of visual lighting comfort and how it may be attained is soon to be initiated in cooperation with a number of Western universities. The Pacific Coast Electrical Assn. will sponsor this activity. Out of this research should come knowledge that will insure the best possible lighting for the $200,000,000 of new school buildings to be constructed here in the West in the next few years.

Bells Toll for the Dealer

ARE the so-called discount houses sounding the death knell of conventional appliance distribution? If developments in San Francisco are typical of the country as a whole, and we believe they are, then the answer is "yes." That is, unless the appliance industry meets the issue immediately with courage and realism. Consider what's happening in San Francisco:

Approximately twenty-five discount houses operate in the Bay area with 300 or more organized discount clubs. These clubs serve the following groups: armed forces personnel, including veterans, federal employees, state employees, city and county employees, union members, and countless industrial, commercial and social groups. No firm is too small to have its employees

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enrolled in a club that bears the firm name. In addition more than 150 Bay region unions have endorsed one or more clubs and have sent cards to their members recommending discount purchases.

Virtually every conceivable nationally advertised branded appliance is available through these channels. What one discount house does not carry, it will secure for a member purchaser from another house.

There are instances also where wholesalers are being discriminated against in the purchase of supplies if they refuse to sell appliances to industrial employees' associations.

The effects of this drain upon legitimate appliance channels have begun to be felt. It is reported that a number of appliance dealers are in the hands of the board of trade. It is rumored that several major downtown stores will discontinue their white goods departments. No dealer in the city can afford outside salesmen. The appliance price structure is a farce.

How can a legitimate dealer, trained by experience over the years that promotion and servicing are essential to success, continue to live in such an unhealthy selling climate? The answer is that he cannot.

The selection and control of the channels of distribution are functions of the manufacturer. The problem of the discount house is his to condone or to control. If he fails to accept the challenge and the responsibility, then he is placing his tacit seal of approval on the death warrant for the manufacturer-distributor-retailer chain of distribution.

NOW the electrical manufacturing industry has needed no preferential treatment and has asked none on the vast majority of its products. Wherever goods can be produced at a rapid rate on an assembly line, wherever mass production and mass distribution of consumer goods are concerned, the industry has demonstrated that it can offset the low foreign wage rates. In radios and lamps, ranges and refrigerators, motors and washing machines, we have successfully met foreign competition in design, price and quality. But not all products of this industry are subject to such mass production techniques. Heavy electrical power equipment is produced painstakingly in terms of a dozen units a year instead of millions. This comprises water wheel generators, turbine generators, power transformers, circuit breakers, rectifiers and accessory equipment. These pieces are all tailor-made. They require thousands of hours of highly-skilled labor—labor that is paid an average of over $2 an hour and that represents as much as 50 per cent or more of the total production cost. Extensive and continuing basic research and development engineering are involved. This country can build these units supremely well because the industry has made large investments in plant, equipment and employee training . . . At least nine European countries are now competing for the limited volume of American purchases of heavy power equipment. Some of them are nationalized companies and some are nationally subsidized. These companies pay their workers wages that in some cases are only one-fifth and in just one case are 40 per cent of the comparable American wage. The American manufacturer of such heavy equipment simply cannot compete, solely on a dollar basis, with foreign companies. Such competition will be impossible until those other countries catch the American vision of a high standard of living for their workers made possible by high wage rates and maximum mechanization.—Gwilym A. Price, president, Westinghouse Electric Corp.

Modern front is floodlighted from units recessed in the soffit. Second floor shows the troffers with accent spot downlights between

New Life and Light for Out West Begins

Rebuilding around a going business without interrupting that business or the construction too much is a neat trick if you can do it. But it was successfully accomplished by Out West Printing & Stationery Co. in Colorado Springs last year. To do so the store crowded itself into half its usual frontage and was temporarily walled in there while the complete remodeling of the building went on below, beside and above it. When the other half of the first floor was finished it moved in there while the old "island" in the midst of the job was torn out and finished to match the new part. Result is a two-story, mezzanine and basement building with a modern all-glass frontage as attractive as anything in the area and electrically far more farsighted than usual.

Architect Edward L. Bunts called upon Arthur F. Weers electrical planning service of Denver for the electrical engineering, and Whitney Electric Co. kept the electrical facilities of the old part functioning while installing an up-to-date bus duct service, new circuit breaker panelboards, fluorescent troffers with incandescent downlights and ample floor outlets. Moreover Weers provided extra capacity for the inevitable growth in electric usage. "The system was designed," he said, "to carry future loads with no rewiring necessary.

"The service and main distribution panel were designed to carry 35% additional load above the connected load of 140 kva, or a total of 216 kva. This is installed capacity."

Service comes in at the rear over a loading dock from an alley pole to a BullDog low-impedance bus duct, containing two ½x1 in. bars per phase with half size neutral, rated conservatively then at 600 amp but the rating on this bus has recently been increased to 800 amp. The duct was enclosed on the vertical run to the basement for mechanical protection and to reduce dust collection. Fire stops were installed at each floor.

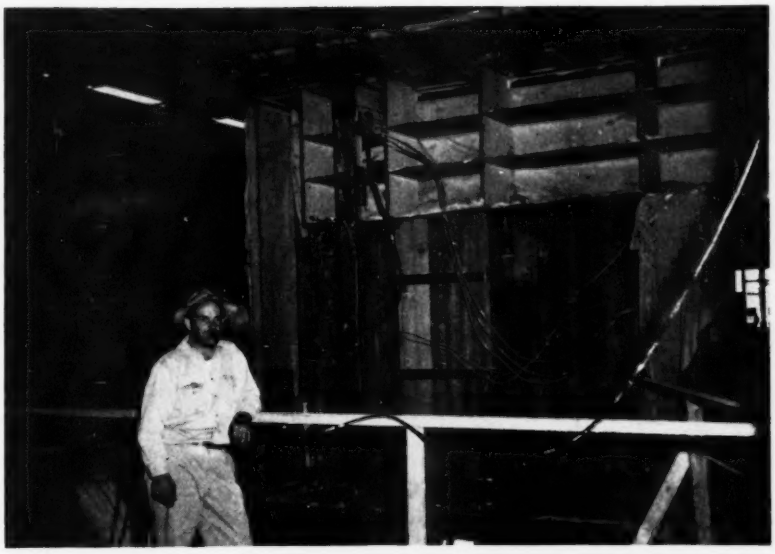
A 600-amp, three-phase, four-wire, 120/208-v main breaker at the base of the bus duct was placed ahead of the current transformers mounted below it, to provide protection for personnel who might be working on them, which is standard practice in Colorado Springs. From the current transformers the 600-amp bus bars were run into the adjacent circuit breaker distribution panel. It contains the following thermal - magnetic breakers: one 150 amp, three phase; one 125 amp, three phase; four 100 amp, three phase; two 50 amp, three phase and one 15 amp, single phase for exit lights.

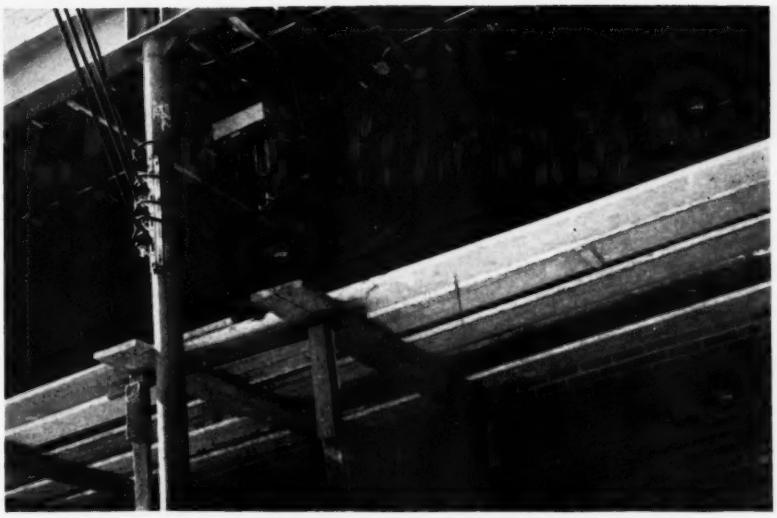
Feeders to the panels were sized to provide additional capacities above the connected load with less than 1% voltage drop, as follows: power panel, 14%; basement lighting panel, 65%; first floor panel, 35%; show window panel, 52%; sign panel, 60%; mezzanine panel, 58%; second floor panel, 40%. All branch circuit wire is No. 12 or larger. No. 10 wire is run to the first outlet of every circuit 50 ft or farther from the panel. An elevator and dumb waiter were also included.

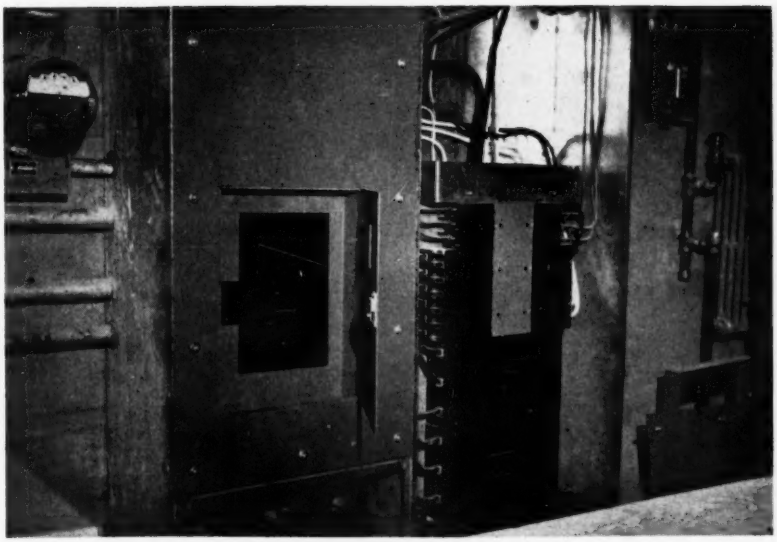
One branch circuit panel with split buses was used to feed the front display lights. One section of this panel feeds all show window lights and receptacles and the other all outside front signs and lights mounted in the soffit to floodlight the recessed front of the building. Each section of this panel is controlled by a mechanically held magnet contactor, and the coil circuit of each contactor is controlled by a three-way momentary contact switch adjacent to the night light switch on the show window bulkhead.

Floor outlets, both for 120 v and telephone, were provided on the balcony for administrative operations if required or for lighted displays or signs. Floor receptacles and duplex receptacles were placed on the main floor to supply the show cases. Three- and four-way switching was used in rooms with multiple entrances. With glass windows starting at 3½ ft in a majority of partitions and narrow

Kenneth Hook, superintendent for Whitney Electric, standing beside temporary wall around old portion of the store where business was done while the remodeling around it was going on. At this stage the other half of the store was nearly ready to move into. The troffer lights were installed and operating. Center picture shows the service connection to the ventilated horizontal section of bus duct mounted to the roof of the loading dock cover above second floor windows. Bottom picture is of main 600-amp breaker at foot of vertical bus run, with current transformers below and distribution breaker panel alongside it. When covers were installed the compact, matched panels made a neat appearance







door jambs, the switches were placed on the lock side of the door but just below the windows. Conduit was run to the floor, through it and up a solid wall to the ceiling lighting fixtures.

In the fan room the two-speed, 10-hp supply fan motor is out of sight of a convenient location for the starter. Therefore a disconnect switch was placed ahead of the starter and a lock-out stop button station installed adjacent to the motor. The lock-out stop station is wired in series in the stop circuit of the starter to eliminate the need for two disconnect switches, one for each speed winding, in the close quarters around the fan motor.

A level of illumination of approximately 50 f-c is obtained on the selling floors with a system of Day-Brite three-lamp, (40-w) troffers with Holophane lens and 150-w recessed accent lights. The troffers are arranged in attractive patterns, differing according to the distribution desired below them. The recessed incandescent and spotlighting units are adjustable to highlight counters and displays. Windows are lighted from PAR lamps in louvered swiveled adjustable hood fixtures.

The front of the store is floodlighted from three recessed floods at each end of the soffit. The glass extending from the projecting display windows to the second floor ceiling level makes a large display window of the second floor where office furniture is displayed.

On the second floor a cove runs along each side of a dropped ceiling. In this cove a continuous strip of 40-w fluorescent lamps is installed. Eight-foot-long troffers are set into the dropped ceiling. In this area the average foot-candle intensity is 80.

Close coordination with the other crafts and care to protect the business operations of Out West Printing & Stationery Co. from the dust and disturbance from so major a construction job were prime considerations by Whitney Electric in doing this job—and on time.

Over 50 ft of lighted valance in the San Diego living-dining room. Each of 51 features tagged, such as master push-button control

Light Conditioning Helps Builders to Sell

Whether it is in Lakewood, Colo. (below) or San Diego, Calif. (above) light conditioning helps builders sell more homes. And when adequate wiring goes with light conditioning it brings a realization to such builders that they have selling features that bring sales.

Holiday Home, promoted by San Diego Gas & Electric Co. and built by Harmony Homes Inc., with Lemon Grove Electric Co. as contractors, was notable because the builder incorporated 51 special features, most of them electrical, each marked with a number. Pamphlets handed to visitors explained the advantages of each and customers could order as many of the features as they wished. Alan J. McCutcheon Jr., home lighting advisor for SDG&E, who handled the promotion, reports that the builder and the electrical industry considered the home a complete success and at least two more such are planned per year now.

Public Service Co. of Colorado received a strong letter of commendation from Mark S. Waggener, president of Western Homes Inc., the builders who were persuaded to try one such light-conditioned home. "We can never tell you how grateful we are for your talking us into light conditioning our house at 888 Lewis Drive, Lakewood. We were reluctant to go to the additional expense necessitated by light conditioning this home, but the way it turned out it was the most effective advertising with which we have ever been connected . . . through your efforts we were able to sell approximately 15 houses during the 10-day period. We assure you that in our next project we will solicit your help in light conditioning at least one home."

Similar results were obtained at Aurora, by Aurora Associates in a model home there. Jack Reed and Jim Stockett and later Allen Toppin of Public Service Co. worked with the builders to organize the promotion. Meryl Mentzer, RMEL, laid out the adequate wiring and inspected for certification and G. B. Buck II, G-E Co. Lamp Department, designed the lighting layout. More than 1,400 visitors were counted during the 10-day showing of the Lakewood house. Hayes Electric was the contractor. Rite Light Supply Co. supplied fixtures; North Denver Furniture Co. the furnishings.

Lighted valance over window in the Lakewood, Colo., home, and certified lamp too

Let's Not Be Killed With Kindness

urged W. R. Grasle at NECA District 6

In the early days of the electrical industry, the field of the electrical jobber or distributor was pretty well defined.

This consisted briefly of assembling the various and sundry items used in the electrical business, from widely scattered sources, to make them available to the local users of these products. The distributor had salesmen who knew something about the materials they handled and kept informed about new equipment and products as these became available. They carried complete stocks of all standard construction items and had a delivery department that we could depend upon.

The credit department was usually manned by a Scotchman who was very insistent on being paid by the tenth of the month.

In line with modern trends, many businesses are now endeavoring to provide more and better service to their customers. The distributors are no exception to this trend and have been extending their activities far beyond the scope of suppliers. I think it is high time that the contractors take a careful look at some of these new jobber services, or we may be killed with their kindness.

One service offered by many wiring supply distributors is assistance in estimating. Now estimating electrical work involves considerable tedious work, such as counting, measuring, listing, etc. So when the wholesale man offers to take off the lighting fixtures it appears to be a big help, until you later discover that the quantities on which his quotation is based are not accurate, and usually are short of the actual requirements.

The same practice is followed for other groups of equipment such as clock systems, fire alarms, signals, etc., and accuracy follows the same pattern as fixture lists. Many such quotations give a lump sum only, but the supplier protects himself by qualifying the price as being based on the quantities listed in the quotation.

Another common error is quoting equipment that does not meet specification requirements. The responsible and competent contractor spends considerable time in correcting such quotations. On the other hand, the irresponsible or careless contractor often uses these misleading quotations at face value and thereby becomes low bidder. The actual job requirements are still the same, so either the contractor or the jobber must finally pay for the error.

To the responsible contractor this distributor estimating service is not only wasted effort, but in many cases a definite nuisance. This effort could be better used to determine what equipment would meet specifications or be acceptable, and then quote unit prices only. More interest in *following through on orders already obtained* would be service that most contractors would welcome.

One of the older distributor services, that of the credit department, has been extended and has taken on new forms of questionable value to the qualified contractor.

Through the use of these new credit plans some contractors are encouraged to bid work, considerably beyond their ability or credit rating.

One such scheme is the so-called job account plan. The contractor assigns his progress payments and the distributor agrees to accept these as received in lieu of regular monthly settlement. The distributor is usually assured of ultimate payment, as most of these jobs are bonded.

The contractor however, soon finds that his expanded operation requires increased overhead, and that retained percentages of his contract cannot be used to pay current bills. To bolster his gross income, this contractor takes jobs at margins below the danger line, and hopes for some miracle to get him out of trouble. The ultimate result is obvious and the distributor usually shares part of the loss.

The cycle I have described usually extends over a period of several years before the ultimate crash. In the meantime, millions of dollars worth of good jobs have been spoiled for competent and legitimate contractors, and the prices for all work have been depressed below sensible levels. Strange as it may seem, some of these contractors who fail start up again under a new firm name, and in a short time are again buying on credit.

I am sure that both distributors and contractors would agree that the present situation of contractors bidding work below cost, and distributors competing for orders on the same basis, is nothing short of stupidity. Agreement, however, on a constructive plan to improve this situation is not so simple. Since business based on competitive bids represents a large part of the contracting volume, it would seem that any plan to stabilize costs and credit policies would be a logical approach.

As long as I can remember, wholesalers' net price sheets showed various prices for the same item, depending on the quantity purchased. This pricing method seems economically sound, and I have never heard a reasonable argument against it.

Also in times past, many items carried substantial cash discounts, and the credit policy related to these discounts was rigidly maintained.

If these two items of policy could be re-established and rigidly maintained, I am convinced that it would benefit the entire industry. Such a policy, as I see it, would tend to channel various types of jobs to the contractors best equipped to handle them, and may also tend to enlarge the field for contractor business.

Industrials who now buy small quantities on a par with the contractor, would see more advantage in contracting their work. Such a plan would encourage the contractors to organize their buying to obtain quantity prices, with corresponding advantage to the distributor, who now gives retail service at wholesale prices.

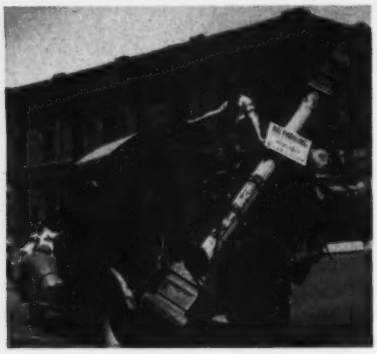
Operation of the discount and credit policy would tend to restrict some marginal operators, but in most cases they are no asset to the contracting business, and their own interest would be better served by such a plan.

With prices stabilized and credit policy established, contractors could compete on the basis of ability, efficiency, and reputation. The distributor's credit problems would be greatly reduced, and they could sell their materials on their merits, instead of price only.

From these rambling observations, I want to recommend certain specific items that I think would prove of ultimate benefit to the contracting business:

1. Distributors should abandon their estimating service for contractors.
2. Quotations should state that items quoted meet specification requirements or have been specifically approved for the job at hand.
3. Quote only on contractors' request, and quote unit prices.
4. Leave financing of contractors to banks.
5. Maintain uniform price schedules, based on quantities purchased.
6. Establish and maintain a rigid cash discount policy.

I do not want to infer that the distributors are the prime cause of our troubles, since contractors themselves are mostly responsible for the practices we complain of. When we can agree on a sound program, I am sure the distributors will cooperate.



Pueblo's Main St. relighted in mercury. City Manager Loman, Dick Pemberton, Southern Colorado Power, prepare for celebration

Street Light Grows

Pueblo celebrates and Utah cites examples

Something of a "whing ding" was thrown in Pueblo, Colo., on the occasion of turning on 14 blocks of new mercury street lighting along Main St. late in May. The new system through the business section on Main St. consists of 55 G-E 109, 15,000-lumen mercury units mounted on 30-ft Union Metal poles with 6-ft bracket arms over the paving. The standards are staggered, with a spacing of about 85 ft.

The mercury system replaces an old ornamental system of 6,000-lumen incandescent lamps, eight to the block. The new system is a part of a "cleaning up" of Main St. since the removal of streetcars, tracks, trolley poles and the ancient lighting units. A similar replacement is planned next year on Court St. from 14th to Union.

Overhead service is used on the Main St. system so that taps can be taken off for Christmas decorations along this street.

Although Denver is often credited with the first mercury street lighting installation, Southern Colorado Power Co. says it was first with the lighting of a street parallel to Main in 1936. Commissioner Cranmer of Denver parks and streets came down and saw the installation and said: "That's what I want."

City officials, including the mayor, city manager, city engineer, city council, service clubs and the fire department staged a celebration for the turning on of the new lights. Pueblo's school children in the sixth to twelfth grades participated in an essay contest on "The Value of Adequate Street Lighting in Your Community" for which Southern Colorado Power Co. furnished two table-model radios for the winners.

Home Grown in Utah

What the neighbors are doing proves to be a strong selling drive for street lighting as well as in other things. This, according to Homer Shaw, Utah Power & Light Co., is being discovered in the results obtained from the distribution of 1,700 special booklets recently prepared, giving a photographic story of recent street lighting installations in its own territory and that of the Western Colorado Power Co.

Originally manufacturers' booklets had been used in direct mail to public officials. However, it was thought that pictures of local installations would stir far more interest.

The booklet, *More Light on Your Streets,* 28 pages with humanized simple captions, was distributed to state, county and city officials and civic leaders throughout the area, as well as business clubs, the company's own staff people and industry salesmen.

As a result cities, where a great deal of contact work had been done for months but no action resulted, suddenly developed a keen interest in safety street lighting and contracts for new lighting began to be signed. Shaw feels that 1953 is going to be the biggest year in street lighting in Utah.

After the booklet was out, a statement was sought from E. Woodrow Walton, Salt Lake City street lighting supervisor, and L. C. Romney, city commissioner, for publication in the company's *Electro Dealer,* intended only as general information to the industry. However, it showed the company active and reprints were made of it and sent to the same people who received the booklet.

Having had such success with the street lighting booklet, similar activity will be undertaken on commercial cooking, with pictures of kitchens.

Use-Area Tables

Performance of wires and cables under actual conditions of use will be the subject of research by a Wire and Cable Users Committee of California, implemented by A. C. Blackman, chief of the Division of Industrial Safety, State of California, and for which A. B. Smedley, consulting engineer, is chairman. Objective of the committee will be to prepare wire and cable "use-area" tables, few in number and simple in application. Tables will be built upon data representing cable practice and will take into account sound engineering factors, economics, conservation and safety. In the program the committee will recognize that in service some depreciation in the physical and mechanical properties of wire and cable insulations for all uses at 600 v and less is acceptable practice. Aim is to make the tables useful, both in design of installations and enforcement of the Safety Orders.

Cooperation of industrial plants and utilities to obtain historical data and make use of limited instrumentation will be sought. All load areas that place similar loading demands on wire and cable will be classified in the same use-area tables. The rubber-covered conductors will be those under consideration and chiefly in the larger sizes.

A staff of not more than 16 competent engineers will be invited to serve and to constitute the committee. They will represent the Building Owners & Managers Assn., California industrial plants through industrial safety societies, California Municipal Utilities Assn., California Society of Professional Engineers, Division of Industrial Safety, Electrical Maintenance Engineers Assn., Pacific Coast Electrical Assn. and International Association of Electrical Inspectors.

Conflict between NECode and Safety Orders stems from this question.

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

A Western president

W. M. Hogue, of Larson-Hogue Electric Co., Los Angeles, was elected president of the National Industrial Service Assn. at its annual national convention in New York City late in May to become the first far Western president of this motor shop organization. Hogue has been active on committees, a director and last year was vice-president. If truth were known the origin of the motor shop organization was probably in the motor section setup in the California Electragists by Cy Geisbush, then its manager. From this started a motor section in NECA that later broke away to form a separate association, NISA. The West now has several strong chapters of NISA—in Los Angeles, San Francisco Bay area, Portland, Seattle and Vancouver, B. C., as well as individual members in many other Western cities.

Building better

Construction took a spurt upward. It really began earlier in the year, but became noticeable in May and continued in June. A lot of it was the higher cost of building reflected in bigger expenditure totals, but it was about 10% higher than April and 6% above last year. Commercial building was the largest proportion, with residential next. Weather improvement released much activity.

Not hurt yet

Effect of wage increases beginning July 1 had not yet been felt. Hence the question whether they will slow down new building is still academic. Many contracts in all branches of the construction industry have June 30 termination dates. New hikes for electricians gave rise to similar yeast in other trades. In 42 counties of northern California the AGC shut down construction refusing to pay a 20c-an-hour increase for laborers. The home builders among AGC withdrew from the latter and signed up separately but all major projects were down. That included schools, commercial building, industrial—the major market for much of the electrical equipment industry. It makes an expensive "vacation." Then the plumbers went out.

Danger of fine too

Don't get any equipment within 6 ft of a power line. Not only is it dangerous but in California it can cost a fine. A municipal court in Carpenteria found R. D. Duffy guilty and fined him $25 for getting the boom on a crane he was operating too close to a power line. He had previously hit a line and fortunately was not hurt; was warned; later did it again and was arrested. Fortunately no one was hurt either time. In a previous case a man was killed. This case strengthens the law even where no one is injured. The Division of Industrial Safety now has leaflets that are handed out to workmen and operators in regard to its Safety Orders. These cover prevention of accidents due to proximity to overhead lines, others to underground cables and in switchyards.

Steel is up

Material prices seem uncertain whether to follow the price of steel up a notch. Copper supply seems reasonably adequate and the pressure is off price there. Competition is a brake on price increases now even though higher wage rates would be expected to reflect in price.

Customer strike

Signs which nobody seems to pay attention to as showing public reaction to higher costs of electrical work: More work performed by owners; more labor-only contracts, the materials being bought direct; more pressure on cities to break down such "high board fences" as licenses, examinations, all-metal codes; more gadgets to do one's own wiring or materials to simplify it; more residential wiring being done nonunion.

Train for Chi.

An interim business meeting and conference of the Southwestern Section, International Assn. of Electrical Inspectors, is all set up for July 20-22 at Mar Monte Hotel in Santa Barbara. It will prepare those who attend the Chicago joint convention of all IAEI sections, Sept. 21-25, with the code questions and changes the Southwestern Section wants to bring up. Programs have been mailed to all members.

"Take it easy"

Harry Romick, veteran electrical inspector of San Francisco, retired June 30, after 29 years with the city. The last few years have been on the unsafe appliance checking detail or sales control. Harry was called one of the "Gold Dust Twins," by Harold Gerber because he and the late Nick Siggins were always together and always the life of the party at inspector or union activities.

Within reach

Down payments may go down again and terms extend to 30 years instead of 25 if a bill now before Congress passes and there is a good chance it will. When credit restrictions went off and money tightened the easy financing of home building stopped and put a crimp in new house sales. The residential real estate market softened and builders and realtors have been crying. It definitely slowed down new house construction also. Only way the banks and loan companies will take such long risks is with Federal guarantees. Hence the bill. Prices for a small house have gone so high that a 20% down payment and 25-year terms take too much cash.

Modernize homes

To stimulate some house repair and remodeling under Title I, FHA called a group of specialists together for advice. J. O. Elmer, vice-president, American Trust Co., San Francisco, and chairman of the 12th Federal Reserve District consumer credit committee, was appointed to the committee by Commissioner Guy Hollyday.

Another round

Wage increases for electricians and some health and welfare programs have emerged from the confusion of negotiations during the spring and the increases take effect generally July 1. Oakland corrects us to point out that its deal was a 5½c increase in pay from $2.95. The vacation of 4% had previously been granted. It is now 4% of $3, plus 7½c for welfare, and NECA and IBEW there are working out a joint trusteeship as they did the vacation plan. With vacation the former $2.95 became $3.068 and what San Francisco did was bring itself up on par with Oakland, which meant a 19½c total increase there. Sacramento settled for $3 plus 7½c welfare. Los Angeles and San Diego gave 10c "in lieu of welfare." Stockton, which went to the Council, stays at $3, had welfare denied. Spokane also went to Council, gave an 11½c increase to $2.82½ but had health and welfare denied. In denying it the Council expressed favor for the idea but said more study to establish actuarial soundness should be made and negotiated locally. Las Vegas, Nev., just gave an extra 15c to make $3.05. It had been 10c behind Reno.

Chapter is born

Nevada Chapter of NECA is taking shape as a dues structure of 1½% of labor pay roll was set and search started for a manager to establish an office either in Reno or Las Vegas.

New line grouping

A line construction council is being set up instead of a chapter by the California and Nevada Chapters of National Electrical Contractors Assn. In the council each chapter would have one member representing outside work, one inside work. The council will then appoint a negotiating committee to seek an area agreement. One is being negotiated now with line local No. 1245 covering northern California. The problem is complicated by the differences in wage rates recently negotiated in various chapter areas. Paul Smith, NECA field representative, is working on the problem of correlation.

Grinding slowly

Federal Construction Contract Bill was still in the mill of the gods in Washington as this went to press. Earlier last month there was hope it would get to the floor after favorable action in the committees. The Senate bill, 848, at least was on the calender for July 6. This is the law wanted by contractors to stop bid peddling and shopping.

Educate school men

Two important school institutes were held at Stanford University, the first on Operation and Maintenance of School Buildings, June 22-26; the second, on School Planning, June 29-July 3, both under the direction of Prof. James D. MacConnell. The institutes were for school executives and experts in various fields were brought in to impart information on school design, materials, equipment and maintenance. Speaking on lighting subjects were John S. Walsh, chief illuminating engineer, Pacific Gas and Electric Co., and Chester W. Jarrett, lighting consultant, Portland General Electric Co. What lighting can do to rehabilitate old school buildings was described from experience by both.

Help yourself

A cafeteria style of display and sale of its numerous lines of supplies and appliances was given its first industry showing by Northwest Electric Supply Co. when it moved into its new and larger place at S.E. Seventh and Alder St., in Portland last month. Over 500 in the electrical business came to the open house and many other wholesalers declared intentions to convert to the same merchandising method, says G. W. Exel, who with G. R. Phillips owns the business. (Story soon.)

See the lines

A manufacturer's exhibit, that turned out to be such a success it will be an annual affair, was staged by Gilson Supply Co., Oakland's oldest electrical wholesaler, for its customers in the electrical, industrial and engineering fields on a Friday and Saturday in mid-May. Each manufacturer of lines handled by the company had an exhibit and many had demonstrations. Emphasis was on the new in design and equipment in lighting, cooking, heating, wiring and industrial.

Snap is gone

Quiette switch, a silent tumbler switch without mercury or liquid for the contact, is a sensationally new wiring device being promoted heavily in shelter magazines tying in the electrical contractor by Arrow-Hart & Hegeman Electric Co. Among contractors and engineers there's a contest to guess how many cycles the switch will stand on a life test. The one in its trade show exhibit had registered 68,118 cycles by June 1. With such a record A-H&H can well claim it "lifetime."

News in light

Some new things in lighting include—A new recessed troffer line of commercial fluorescent fixtures of different lengths to combine in various patterns is announced by Sylvania Electric Products. Lightolier has launched a new "portfolio" fixture program through a limited top distributor franchise where special show facilities are available in order to reach upper level homes and public buildings with a luxurious style of modern contemporary fixtures. It also has developed an attractive line of Young Modern designs. . . General Electric's lamp division has a new full-color large lamp catalog, the most complete yet; announces six new reflector 150-w color lamps with the color baked in; and it too has now announced electroluminescent cold light panels for illuminating clock faces and instrument panels . . . All-Brite, or Fluorescent Fixtures of California, has a new pump island lighting unit that is its own canopy and provides for mounting of cluster lights to the canopy if desired . . . Solar Light Mfg. Co. with a plant at 444 N. Western Ave., Los Angeles, is having fine response to its Solarlite Chalkboard Dean unit for school applications . . . Globe Laboratories of Sherman Oaks, Calif., has a nontoxic cloth treated to destaticize plastics and paints, called De-Stat cloth.

Greek named

First showings of the new Wakefield Geometrics, a system of geometrical units in modules that can be arranged for all manner of luminous ceiling conditions, will be made in Sacramento July 6 and San Francisco July 13 by Ted Bakeman, F. W. Wakefield representative. Ted Wakefield himself presented the display to an architects' convention in Seattle in June. W. A. McGuire, Los Angeles, and F. C. Henkel, Portland, will soon make such exhibits also.

Hot glass

A new electric radiant glass heat panel called Berko, using Pyrex glass permanently coated by Corning Glass Co., is being manufactured in San Francisco and distributed by Empire Supply Co., 1065 Valencia St. Wall and portable units come in 110, 208 or 220 v; 600-, 700-, 1,000- and 1,250-w sizes.

Showing automation

Westinghouse's industrial "push button control show," traveling in a 34-ft, 10-ton coach starts its Western swing July 6 at Denver and ends it Sept. 11 at Geneva, Utah, covering 2,978 miles and putting on a pitch at 22 places. It will give a 1½-hour program for groups of 10 people to show "automation" applications to industrial machines.

Still growing

General Electric Supply Co. opened its 147th branch in San Bernardino, June 12. The new branch occupies 25,000 sq ft, is located at 485 S. I St. and V. S. Cooper has been made its manager. He has been with G-E since 1946, in GESCO since 1947 as lighting specialist and assistant sales manager of supply and apparatus. The supply company recently opened a new building in Long Beach and has a new one under construction in San Diego.

Agents organize

Rocky Mountain Manufacturers Representatives Club has been formed and Joe Ray of C. D. Belt Co. is its chairman; Joe Vivian of E. T. Voncier Co., vice-chairman; E. W. Staible of Fred E. Staible & Son, secretary; Harry Ream, treasurer; and I. W. Strong, Appleton Electric, chairman of the achievement and promotion committee. It meets the third Thursday for a dinner meeting; the first Monday for a luncheon at which "the jobber of the month" is a guest. It plans to make a complete directory of representatives in the Mountain states, listing the manufacturers and products, which will be circulated to purchasing agents, architects and engineers. A big trade show is planned in the spring.

National group

Meanwhile Electrical Equipment Representatives Assn., a national organization, holds its annual summer meeting at Glenwood Springs, Colo., July 15-17. Earl S. Condon of Los Angeles is its president; Richard Kent of New York first vice-president and Howard Peterson of Denver is second vice-president. Purpose is to promote high ethical standards among members and improve their service to manufacturers and customers. Next winter meeting of EERA will be in the Biltmore, Los Angeles.

New quarters

Earl S. Condon Co. moved out of its offices at 1151 S. Broadway, Los Angeles, to Suite 815 in the Tishman Bldg., at 3460 Wilshire Blvd. It represents Burndy Engineering Co., Lapp Insulator Co., Cole Electric Co., Carma Mfg. Co., Preformed Line Products Co., Specialty Device Co., U. S. Rubber Co. wire and cable division.

Expands

Thomas & Betts Co. branch in San Francisco moved out of the congested district at 550 Natoma St. into the Bayview industrial district near Hunter's Point Naval Shipyards, to 645 Phelps St., corner of Hudson, where E. Len Johnson, district representative, says triple capacity is sure to improve service to the trade.

For single to 3-phase

A converter to operate three-phase motors from 1 to 10 hp from single-phase sources, called Motor-X, made by Motor-X Products Co. of Cincinnati, should prove a boon to farms wanting pumping for sprinkler irrigation but which are served only with single-phase power. The device contains branch circuit and motor running overcurrent protection, disconnecting means and motor controller.

New policy

Ted W. Briegel, president of Briegel Method Tool Co., in announcing that W. W. Kingsbury, former vp and treasurer of M. B. Austin Co., has joined Briegel as sales manager, declared all sales will be direct to wholesalers through a newly appointed group of manufacturers' agents.

Need a starter

Entries from the West in the lighting competition for electrical contractors being run in Electrical Construction and Maintenance magazine are either bashful or slow starting, Berlon Cooper reports and reminds that some of the best lighting jobs in the nation are done in the West by contractors and should win prizes. The contest closes Aug. 1; no time to lose to make a better showing for the West.

Better trained

Contractors' division of the Electric League of Los Angeles held its commencement dinner June 23 to "graduate" 23 electrical contractors who had successfully completed a course on estimating conducted by Leo Allen, executive vice-president of the League.

Long wanted

A national certified relighting program for commercial and industrial premises is being launched as the backbone of local campaigns by associations and leagues, by National Electrical Manufacturers Assn. commercial and industrial lighting equipment section. A national bureau, similar to the National Adequate Wiring Bureau, is to be set up at NEMA headquarters to run a certification plan. The program was decided upon after it was found in a test city last year that more than 85% of the lighting in commercial and industrial interiors is substandard. Pilot operations of the new plan will be started this fall and early next year.

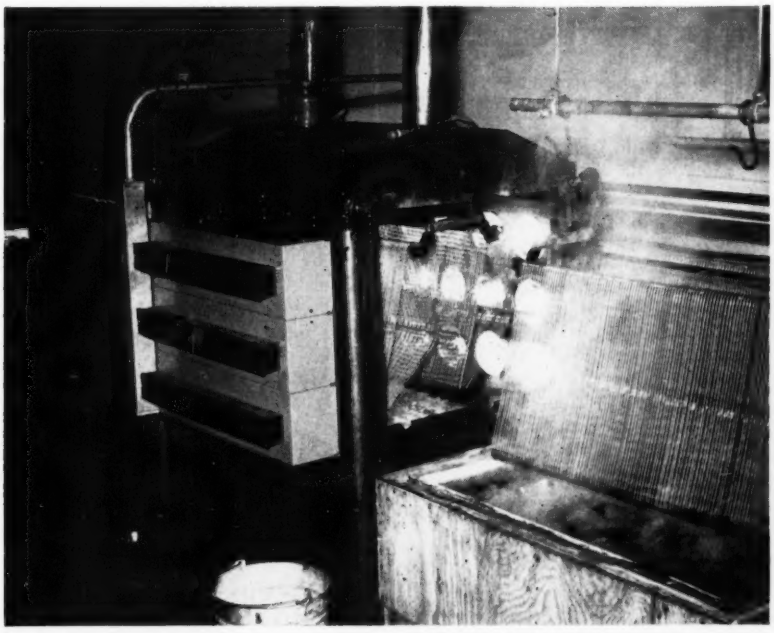
Guides

Two new standards have just been released by the Illuminating Engineering Society. The first is the new American Standard Practice for Street and Highway Lighting, a 32-page booklet. Second is Recommended Practice for Supplementary Lighting, to be used with the recently published Industrial Lighting Standard. IES annual conference this year will be at the Commodore, New York City, Sept. 14-17.

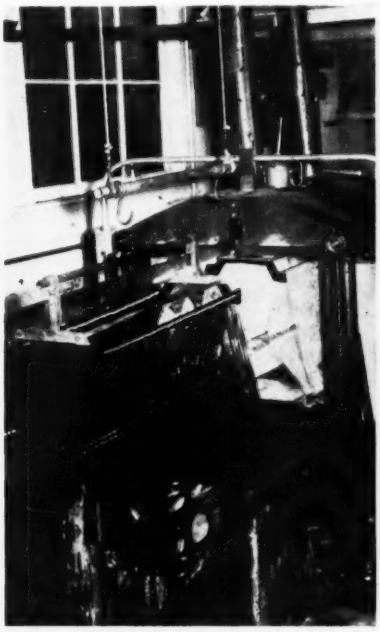
NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION

Utilization Data Sheet No. 89

SUBJECT: Infrared Drying
CUSTOMER: Western Wirecraft Co., Vancouver, B. C.
TYPE OF BUSINESS: Manufacturing Coat Hangers
SERVICE COMPANY: B. C. Electric Co. Ltd.
DATA PREPARED BY: R. W. Fiddes, Commercial Representative



Racks holding 200 wire clothes hangers are dipped to remove grease and oil, then are dried in a 3-kw infrared oven preparatory to enamel dipping and drying in second oven



After hangers have been dipped in black enamel they pass through 12-kw bake oven

Western Wirecraft Co. of Vancouver, B. C., uses two batch-type infrared ovens in the production of black enameled coat hangers. A 3-kw oven dries the hangers after they have been cleaned, and a 12-kw oven dries the paint on the hangers after they have been dipped. Two employees produce over 5,000 hangers per eight-hour shift.

The hangers are formed from coils of wire by automatic cutting and forming machine. They are then placed on racks, each of which holds 200 hangers, and dipped in a degreasing tank to remove any oil or grease from the wire. The solution in the tank is kept at 100 F by a thermostatically controlled immersion element.

The hangers are made ready for painting by drying them in the small infrared oven. This oven, which contains 24 125-w infrared lamps, dries two racks of 200 hangers each in three minutes.

When dry, the racks of hangers are dipped in a tank of synthetic black enamel and passed into the second drying oven. This oven, which contains 48 250-w infrared lamps, will dry 400 hangers (2 racks) in 20 minutes.

Operating Data

Degreasing tanks	1 kw
Drying oven, 24 125-w lamps	3 kw
Baking oven, 48 250-w lamps	12 kw
Total load	16 kw
Energy consumed per 8-hr. shift	75 kwh
Production per 8-hr. shift	5,000 hangers
Operating cost per 1,000 hangers @ 1.5c/kwh	22.5c

Advantages

The infrared ovens produce a uniform high-quality product so necessary in this highly competitive field of manufacture. They reduce labor costs because they require no attention from the operators who can devote their full time to the details of hanger production.

Maintenance costs on the ovens are negligible. The lamps last about 4,000 hours, which is the equivalent of two years' operation. The ovens are very efficient. Fifteen kilowatt-hours will do both drying operations for 1,000 hangers. Ovens will handle about 10,000 hangers per eight-hour shift, or the output of two cutting and forming machines.

Oliver

Ralston

Cranston

Sam Scott, zone president, as he opened meeting

NAEDistributors Face Up to Selling Market

Nobody would be quoted on the really hot topics of conversation in unofficial personal gatherings. These related to the concern over present pricing malpractices, mark-up, cash discounting, and the squeeze between rising costs and a softer market.

But the official program brought to the 300 or so electrical supplies distributors who met for the spring convention of the Pacific Zone of National Association of Electrical Distributors, at Huntington Hotel, Pasadena, June 8-11, a group of experts to tell them of trends in the market for building, market development, organization and copper supply and its effect on price. Howard Emerson, Pacific Coast editor for *Electrical Wholesaling* sums it up like this:

Residential Market to Be Good

Business from the residential construction market will continue high through 1953, according to J. M. Dean, secretary-manager, Building Materials Credit Assn., Los Angeles, in his talk at the opening session. But there will be more problems involved in getting that business and in getting paid for it, he pointed out. While no drop in residential construction is expected, and there will be no drop in the extension of credit, interest rates will be much higher and money will be more scarce.

Dean discussed changes that have taken place during the past few years —1952 business was 7% above 1951, and 1953 is even higher so far—credit sales increased 90% in '52 over '51. And he pointed to factors that are signposts warning business for the near future—in the 11th FRB district, collections have dropped off severely and bankruptcies have increased sharply, from 130 in 1950 to 280 in 1952 and to 229 for the first four months of 1953.

Copper Pricing Has Uncertainties

One of the most clarifying pictures of the copper production and pricing scene ever presented to this West Coast wholesaling group was made by Glenn E. Ralston, vice-president and general manager, Rome Cable Co., Rome, N. Y., during the opening session. He outlined the various foreign and domestic sources for the nation's supply of copper and discussed frankly the many factors influencing the cost of that copper before it reached the wire and brass mills. Ralston anticipated a good supply of copper for the future, and at the same time expected a continuing market for copper products with only the utilities and public building markets diminishing in demand. He expected the dropping off in Europeon buying of Chilean copper and the coming into production of high-priced domestic producers to be important factors in future pricing of copper.

More Personal Service

Following Ralston's talk, the distributors heard an inspiring talk by W. E. Cranston, president, Thermador Electric Mfg. Co., Los Angeles, on the future of the electrical industry and its market, particularly in the Western United States. In order to continue to get their full share of this business, the electrical distributor must put more emphasis on personal service to his customers, said Cranston. Important in being able to present this personal service will be the development of better trained distributors' salesmen, particularly the young men who have been taken into the industry since the war, a period which has been primarily a sellers' market.

More Housewares Business

The electrical distributor handled 57.3% of the traceable volume of electrical housewares in 1951 and his percentage of this nearly one billion dollar business went even higher in 1952, said R. M. Oliver, Westinghouse Electric Corp., Mansfield, Ohio, in his talk to the session devoted to the appliance business. "This share can be bigger and in my opinion should be bigger," Oliver stated. "Electrical distributors are still the backbone of the portable appliance business and we believe this will continue to be so."

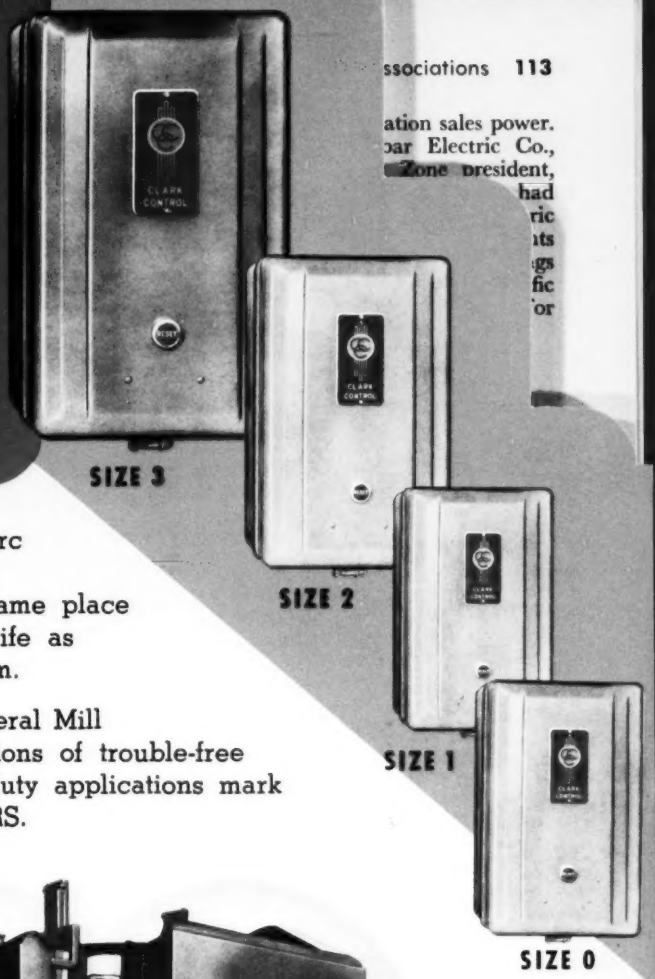
Oliver pointed out that in spite of the many billions of dollars worth of small appliances purchased before and after the war, the "unsaturated" market seems to get bigger. He showed that 80% of the homes still do not have steam irons, 29% don't have toasters, 49% have no coffee makers, 91% do not have roasters. But he pointed out, in spite of that pretty picture, the biggest market for the electrical distributors is in the "saturated appliances." "The old stand-bys —irons, toasters, fans, and other products we have been selling for years in constantly increasing numbers — are still the big volume lines and will continue to be for a long, long time," he said.

Better Sales Meetings

Most sales meetings can be made twice as effective by developing a simple, orderly technique of organizing each meeting, according to Elliott Taylor, manager public relations, Pacific Finance Co., Los Angeles, in his speech to the Pacific Zone wholesalers.

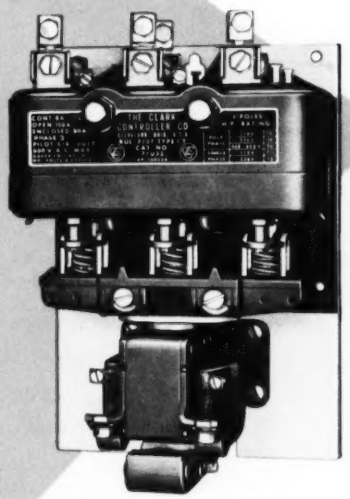
As New as Tomorrow!

CLARK TYPE 'CY' STARTERS

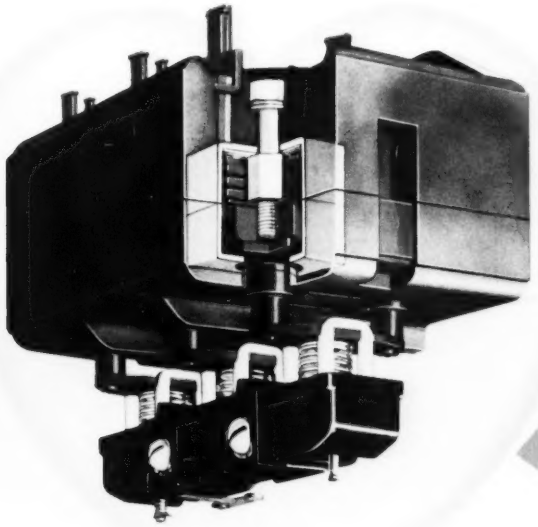


In Sizes 2 and 3, an entirely new method of arc quenching is employed. The arc is constantly forced to rotate, never striking the same place twice. This insures longer contact life as pitting and wear are reduced to a minimum.

Sizes 0 and 1 use the same general Mill Type construction as the larger sizes. Millions of trouble-free operations in all types of heavy duty applications mark the use of CLARK TYPE "CY" STARTERS.



NON-REVERSING SIZE 2 TYPE "CY" STARTER OPEN TYPE



THE WORKING HEART OF THE CLARK TYPE "CY" STARTER

Cut-away view showing magnetic circuit, arc shield and blow-out coil. The top of the Arc Chamber is closed. This prevents accumulation of ionized gases between wiring terminals. Phase to Phase failures are thus minimized.

Ⓐ

ENGINEERED ELECTRICAL CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND STREET, CLEVELAND 10, OHIO

CLARK TYPE 'CY' STARTERS

Available in 4 Sizes and 4 Forms

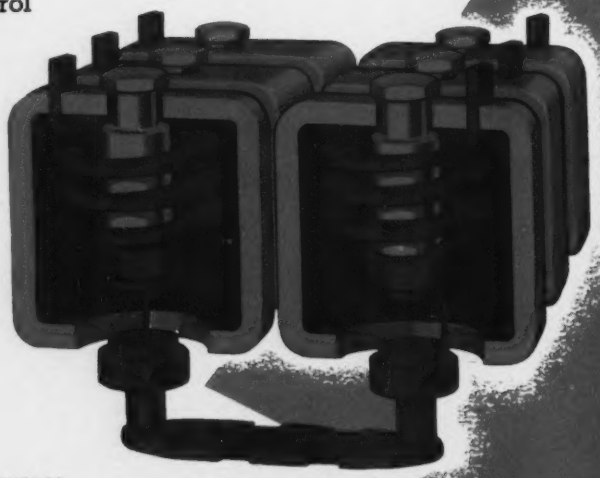
Form MA— Externally operated Overload Reset Button in cover. Separate Push Button or other Pilot Device required to operate this starter.

Form MB— "Hand - Off - Automatic" Selector Switch and Reset Button in cover. Separate 2 wire Pilot Device such as Float Switch must be used to operate this starter.

Form MC— "START - STOP" Push Button and "RESET" Button provided in cover. No other Pilot Device needed. Additional Push Buttons may be used if desired.

For the first time in Electrical Control history, strong twin multi-turn magnetic blow-outs are combined with twin break contacts in economical space.

The arc is extinguished by the effect of the blow-out coil concentric with the contact. The arc is forced to rotate, moving continually from a hot to a cold spot—minimizing burning and pitting of contacts.



That's WHY
You ought to TRY
Clark Type "CY"!

THE CLARK CONTROLLER CO.
ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

He indicated the four phases of any meeting—planning, preparation, presentation and follow-up. In following those steps in organizing a sales meeting, Taylor suggested the following check list: Planning—why is the meeting being held, what kind of meeting will best do the job, who will conduct the meeting and who will speak, when to hold the meeting, who can do the best job of organizing the meeting. Preparation — look for the dramatic, consider audio-visual aids, keep out of the old grooves. Presentation—getting started on time, arrangements for handling questions, arrangements for pictures, etc. Follow-up—analyze how to do it better next time, send the thank you letters, know what results were desired and follow-up to get those results.

The Department Store Market

There is a closer relationship between department store management and the electrical distributors than exists between the store management and any other supplier of goods, said E. J. Shurtz, vice-president and manager, The Broadway, Los Angeles, but this relationship can and should be even closer. "The weakest point in a department store's operation today is its selling," he told the distributors . . . "If the distributor recognizes the retailer's problem in this regard he can do a great deal to stimulate better selling of his product and help the buyer build a more efficient sales force . . ." Shurtz believed that distributors can and should develop a program to train department store sales personnel in product knowledge and product sales techniques. He said that the distributor will find the department store buyer willing and anxious to work out such a plan.

Shurtz brought up what he called "a skeleton out of the closet"—the discount house operations prevalent in the Los Angeles area. He stated that the integrity of the business reputations built by the great manufacturers, distributors and retailers is seriously threatened by trade diversion. He believed that top management in retailing, distribution and manufacturing must recognize the seriousness of the problem, and possibly institute a campaign to educate the "unwary, gullible public, to the fact that all is not gold that glitters and that they get exactly what they pay for."

Selling Capsule

"If the members of the appliance industry . . . have an aggressive plan of advertising, displays and point-of-sale material," there is nothing wrong with the market that can't be cured, said Carl V. Haecker, merchandising display manager, RCA Victor, Camden, N. J. He presented his famous "successful selling capsule" in which he outlines "the four ingredients plus one for successful selling"—aggressive planning, aggressive advertising, aggressive window display, point of purchase, plus demonstration sales power.

Sam Scott, Graybar Electric Co., Los Angeles, Pacific Zone president, who ran the meetings with skill, had appointed Ken Hartley of Electric Corp. as chairman of an arrangements committee which made the meetings run smoothly. R. A. Balzari, Pacific Zone secretary, was coordinator for the program and arrangements.

PCEA Panorama – President's Appointees

PCEA's new administration under President Pengilly took over the reins of the association July 1. To give the new administration a running start, during the convention at Hoberg's then-President D. D. Smalley called a meeting of the board of directors, and Pengilly submitted his selection for section leaders to the board for approval. The new section chairmen are as follows:

Business Development Section: Chairman, Walter F. Chapman, San Diego Gas & Electric Co.; vice-chairman, J. A. Corlett, General Electric Co., San Francisco.

Administrative Services Section: Chairman, George Coughlan Jr., Pacific Gas and Electric Co., San Francisco; vice-chairman, J. T. McNab, Arizona Public Service Co., Phoenix.

Engineering and Operating Section: Chairman, J. A. Longley, Allis-Chalmers, San Francisco; vice-chairman, W. T. Johnson, California Electric Power Co., Riverside.

The new section leaders are now working on the personnel to head up their committees and staff the guidance committees, as well as on plans for their programs and meetings for the coming year. Committee chairmen, members of guidance committees and over-all plans for programs and meetings will be submitted for approval by President Pengilly at the next meeting of the board of directors.

Because of the fine results of the Administrative Services Section's joint meetings with the Accounting Section of the Pacific Coast Gas Assn., continuation of their joint meetings has been approved by the board for the coming year. Administrative Services Section Chairman Coughlan and Vice-chairman McNab will meet soon with the PCGA section leaders to work out their program and schedule forthcoming meetings.

Five regional vice-presidents were selected by the board at Hoberg's to work with President Pengilly. H. B. Sargent, Arizona Public Service Co., will serve for Arizona; L. A. Hicks, The Hawaiian Electric Co., will represent the Hawaiian Islands, and F. A. Tracy, Sierra Pacific Power Co., was elected for Nevada. W. J. Maytham, Westinghouse Electric Corp., will serve for northern California and C. C. Ernst, California Electric Power Co., represents southern California.

The board also discussed the time and place for the 1954 convention. Recognizing that reservations and plans must be made early, President Pengilly and Managing Director Hartley were authorized to investigate facilities throughout the PCEA area and make arrangements at the most suitable location.

● **IAEI Convention**—V. W. Hartley, PCEA managing director, heads the program committee for the International Assn. of Electrical Leagues which holds its first convention in the West in San Francisco, at the Fairmont, Aug. 4-8, and for which Ralph Hubbard, manager of RMEL, Denver, is president.

Flash!

The 1954 PCEA annual convention will be held at Hotel del Coronado, Coronado, Calif., May 19-21. Leon Guibara, U. S. Rubber Co., Los Angeles, has been named general convention chairman.

Plans are virtually completed for the fourth annual Hawaiian conference of the PCEA to be held in Honolulu Nov. 19-20. Sessions will be held at the Queen's Surf on Waikiki Beach. Convention hotel will be the Edgewater.

Possibility of a combined Edison Electric Institute-PCEA convention in Los Angeles in 1955 is being investigated by a PCEA committee. The EEI West Coast meeting has been set for June 13-16, 1955.

Greenough Woodside Campbell

James Piper

Cawlfield Anderson Groth

Accounting, Personnel Men Hold Joint Session

A call to a crusade to teach Americans one simple fact, that the people pay all the taxes, was sounded by George M. Gadsby, Utah Power & Light Co., in opening the joint session of the Accounting and Business Practice Section and the Personnel Section of the Northwest Electric Light & Power Assn. in Salt Lake City, May 20-22. If the people understood this fact—that they, as consumers, pay in the price of the goods they buy the taxes that are assessed to the corporations who make these goods, it would be easier to secure a much needed revision of the nation's tax structure, Gadsby said.

It is the hope of business generally that the excess profits tax may be permitted to die when it runs out in June. This tax leads to waste and extravagance that is reflected in prices, as are all the other taxes paid by producers, and it would be a good thing to get taxes and prices down to head off serious inflation. A reduction in federal expenditures is needed to effect tax reductions and a balancing of the budget, and we should preach the necessity of taking this step to bring stability to the nation's economy.

Responding to Gadsby's address of welcome, John Dierdorff, Pacific Power & Light Co., and president of the association, told the group that the industry's prime concern in the Northwest today is to bring in capacity to meet its expanding economy. Since World War II, the association's member companies have spent $647,000,000 in capital expansion to serve the public. This he stated is $130,000,000 more than the government has invested in the Columbia River power system. He cited a number of developments projected by the member companies, which he said would equal 1,000,000 kw capacity in the next five-year period.

We have been on the defensive but now the people are looking to us to carry the ball. We must exhibit skillful leadership and show the public that the free enterprise way of developing and expanding our economy is the best way in the public interest.

This opening session, a joint one of both sections, was keynoted by Howard N. Walters, B. C. Electric Co., a past president of the association, in his "Three Way Look at Public Relations." We must remember that the collection of individuals forming what we classify as the public consists in part of shareholders in our business and employees who work for us, in addition to those who merely buy our service. We must overlook none of these groups in attempting to develop a favorable attitude and viewpoint toward our business. The starting place lies with the employees, since it is impossible to build public good will without first gaining the respect of one's own workers.

The very success of the investment of the shareholder depends on good relationships with customers, who, if they can be brought to a more ready acceptance of our services, will build up revenues to pay the wages of the capital that has been risked in the business. Customers, we should remember, are for the most part small people, living in small homes, holding small jobs, and with their success and happiness in life depending on small matters. Therefore, we should not overlook the fact that the little things count in our everyday contacts. We should plan each contact to make confidence grow.

The remainder of the joint session was devoted to a panel discussion of employee and supervisory training and the relationships between accounting and personnel departments, with Ralph Kluckner, B. C. Electric Co., as moderator, and H. L. Clark, Portland General Electric Co., F. C. Bash, California Oregon Power Co., Tom Chambers, B. C. Electric Co., Roland Blantz, Portland General Electric Co., as panel members. Company training programs were surveyed and discussed in some detail, bringing out that a personnel hiring department is invaluable to the busy accounting supervisor in selecting and hiring new staff, assisting in promotion and counseling, handling salary negotiations, and in training. Follow-through of training programs was declared to be imperative to show that learning is going on after training has been applied. Training of supervisors is particularly important since the supervisor is the key to well-trained employees under him. He must be sincere, fair, courteous, friendly and impartial, and above all must provide personal leadership.

For the remaining two and a half days in the three-day meeting, each section conducted its own group conference led by its own chairman, the Accounting and Business Practice Section under T. C. Woodside, Utah Power & Light Co., and the Personnel and Safety Section under C. Herald Campbell, Pacific Power & Light Co. The accounting program took up plant and property accounting by E. F. Heim, Utah Power & Light Co., accelerated amortization by Clause Groth, Pacific Power & Light Co., customers

COPPER or ALUMINUM

which conductor shall it be?

"I say COPPER" "I say ALUMINUM"

"We both agree on ANACONDA"

It's not very strange that this sort of agreement is widespread today.

Cable customers vary in their needs. Some choose copper . . . some aluminum . . . some both.

To get the best results from either metal, consider carefully both sound engineering and good economics before deciding. Whatever *your* final choice—it will pay you to *specify Anaconda.*

Anaconda offers you a *single* source of supply for transmission and distribution conductors for every type of service. Modern manufacturing techniques are backed by many years of field-engineering and construction experience plus up-to-date metallurgical and development facilities. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 52476

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Copper and Aluminum Service Cables
Copper, Aluminum and Copperweld Bare and Weatherproof
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ANACONDA ON THE PACIFIC COAST: Plant at: Orange, Calif. District Offices at: Los Angeles, Calif.; San Francisco, Calif.; Seattle, Wash.

Bash Clark

Holton Snow Elder

accounting by Gus Anderson, Utah Power & Light Co., collection policy by J. R. Cawlfield, Mountain States Power Co., and Eldo Halliday, Utah Power & Light Co., internal auditing by Fred J. Carr, California Oregon Power Co., comparative costs related to true costs by Allan Elder, Washington Water Power Co., materials and supplies by Tom Chambers, B. C. Electric Co., manuals by Tom Woodside, Utah Power & Light Co., budgets by A. F. Wilcox, Idaho Power Co., and a number of miscellaneous items by Don J. Ley, California-Pacific Utilities Co.

The Personnel Section program took the form of a series of panel discussions: on employment practices, with Russell James, Portland General Electric Co., moderator, and D. M. Pritchett, California-Pacific Utilities Co., and Robert E. Mason, Idaho Power Co., as panel members; wage and salary administration, with Peter Piper, Washington Water Power Co. as moderator and Morley Fox, B. C. Electric Co., and Hugh Hough, Idaho Power Co., on the panel; labor relations and collective bargaining, with L. B. Jack, B. C. Electric Co., moderator, and Peter Piper, Washington Water Power Co., and C. Herald Campbell, Pacific Power & Light Co., as panel members. Employee services were discussed and their costs explored by Robert E. Mason, Idaho Power Co., moderator, and D. J. McCaig, Montana Power Co.

The accident prevention and safety program, conducted by C. B. Greenough, Mountain States Power Co., chairman, presented Edward P. Allen, safety engineer of Marsh & McLennan, Los Angeles, to define the basic elements of an accident prevention program. Roy F. Elstrom, B. C. Electric Co., reporting on the safety statistics of the member companies for the year, brought out that the records showed improvement from 1950 both as to frequency and severity. The causes of accidents were similar to the causes in other industries, rather than being peculiar to the electrical industry. The biggest single cause was in material handling, while accidents due to electrical burn or shock were in sixth place.

An inspirational address by Dr. William Edwards, dean of the School of Commerce, Brigham Young University, Provo, Utah, featured the joint luncheon session on the last day of the meeting. Our high standard of living and the general satisfactions of our way of life are due, he said, not to an abundance of natural resources nor to any "superman" quality of our people, but to three principal reasons: (1) our form of government built around the importance of the individual and striving for equal and fair treatment to all; (2) the incentives set up to stimulate the average person to maximum development of his talents; and (3) the building and the use of tools to expand man's productive capability and lighten his physical burden. Pat Holton, Utah Power & Light Co., and vice-chairman of the Personnel Section, presided at the luncheon.

The annual banquet, luncheon and teas for the visiting ladies, tours to points of interest in the territory, including the new operations center of Utah Power & Light Co., the Gadsby steam electric generating station, and the Kennecott Copper mine at Bingham, were part of the extra-curricular activities planned by the local arrangements committee, with Eldo Halliday, Utah Power & Light Co., as chairman.

● **Rocky Mountain Electrical League** will hold its 50th annual convention at the Broadmoor Hotel in Colorado Springs, Colo., from Sept. 20-23. Reservations are being taken by the hotel now. Details of the program are promised for the next issue. Special features are planned to celebrate the 50th anniversary of the RMEL and its predecessors.

NWEL&P's New Staff

A. W. Trimble, president of Mountain States Power Co., Albany, Ore., was elected president of the Northwest Electric Light & Power Assn. at the 46th Annual Meeting of that organization in Portland, June 5. He succeeds John Dierdorff, vice-president of Pacific Power & Light Co., Portland, who held the office during the past year.

At the same meeting, R. C. Setterstrom, the Montana Power Co., Butte, was advanced from second to first vice-president, and E. M. Naughton, Utah Power & Light Co., Salt Lake City, was elected second vice-president.

Trimble announced the appointment of J. R. Cawlfield, Mountain States Power Co., Albany, to be treasurer, and Berkeley Snow, to be executive secretary.

Eight members of the board of directors were elected to represent manufacturers, wholesalers, contractors and dealers as follows: Maxwell Wood, Schwager-Wood Corp., Portland; Henry C. Glaze, General Electric Co., Spokane; Paul S. Ousley, Dan Kamphausen Co., Portland; A. L. Wiegenstein, Westinghouse Electric Supply Co., Seattle; A. Morgan, Morgan Electric Co., Seattle; Joseph S. Picatti, Picatti Bros., Yakima; Harold Arnett, Arnett Appliance Co., Albany, and C. C. Musberger, the Appliance Mart, Billings, Mont.

The board of directors will be completed by the appointment of a chairman for each of the four sections of the association and of a representative of each member utility company, along with a group of utility company members-at-large.

Honorary Members

Eleven old-timers of the industry in the Northwest were elected to honorary life membership in the association, bringing the total such members to 72. The following were elected at the 46th Annual Meeting: M. D. Field, California Oregon Power Co.; Clarence E. Boggs, George E. Barnard and Irving E. Joslyn of Idaho Power Co.; Aloph Shipek and A. W. Mathis, Puget Sound Power & Light Co.; Dick Hall, B. C. Electric Co.; Adam Bennion, Utah Power & Light Co.; R. J. Davidson, Pacific Power & Light Co.; J. D. Lewis, Washington Water Power Co.; and Ernest L. Dee, Lamp Department, General Electric Co., Salt Lake City.

CHANCE Plate Anchors

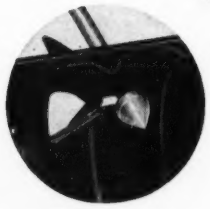
Speed Transmission Guying

...SAVE MAN HOURS—CUT COSTS—HOLD GREATER LOADS

CHANCE NEVER-CREEP ANCHORS

You gain two ways when you choose Never-Creep Anchors for guying transmission or heavy distribution lines. First, they can be installed in machine bored holes because the size of the hole makes no difference in the holding power of the Never-Creep. Second, these anchors pull entirely against solid, undisturbed earth because the hole is at an angle away from the guy.

Never-Creep anchor plates are formed of high strength structural steel and are reinforced in the area of greatest pull with a high carbon steel core plate and the socket or "rod lock" plate which has reinforcing ribs. Dual-purpose creep guards keep the anchor from creeping up the hole and guide the rod point into the socket.



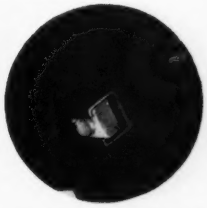
Circle shows reinforcing plate and rod socket.

Chance Anchor Rods, for use with the Never-Creep, are drop forged with a Thimbleye, Twineye, or Tripleye for use with one, two or three guy strands.

CHANCE CROSS-PLATE ANCHORS

The Chance Cross-Plate Anchor helps speed up big line construction jobs. It replaces improvised "dead-men" and can be installed in slanted or vertical machine bored holes in any kind of soil. This all-steel anchor compares in cost with an average 4 foot treated log.

Laboratory tests on a Chance X-24 Cross-Plate proved it capable of indefinitely withstanding a pull of 70,000 lbs. with only slight bending, while a creosoted log split under a 20,000 lb. pull in a few hours.



Nut retainer aids installation.

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

FIND OUT WHY!

It's wise to use Chance Anchors instead of "dead-man" logs or slugs. Write today for test records and actual cost comparisons. We'll send you reasons why your next transmission line should be guyed the stronger, low-cost way — with CHANCE Anchors.

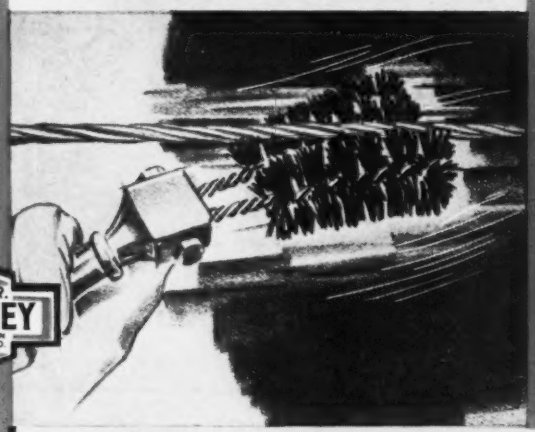
C53-8A

HOW TO MAKE *A Better Joint*

FOLLOW THESE

1

CLEAN the conductors with the *Kearney Cleaning Brush*. Specially designed to clean deep down between strands, this easy-to-use brush removes every trace of corrosion with just a few short strokes; provides a high conductivity transfer surface. The *Kearney Cleaning Brush* is available with sure grip handles or with fit-on head for hot stick use.



2

PROTECT the cleaned surface with *KEARNALENE Corrosion Inhibitor*. *Kearnalene* chemically stops corrosion before it has a chance to start. It's handy to apply; will not harm the skin or damage conductors.

JAMES R. KEARNEY CORPORATION ST LOUIS, MO.

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4224-42 Clayton Ave., St. Louis 10, Mo. • Canadian Plant: Guelph, Ontario

MAYDWELL & HARTZELL, *INCORPORATED*
WEST COAST DISTRIBUTORS
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GOOD CONNECTIONS ARE A VALUABLE INVESTMENT

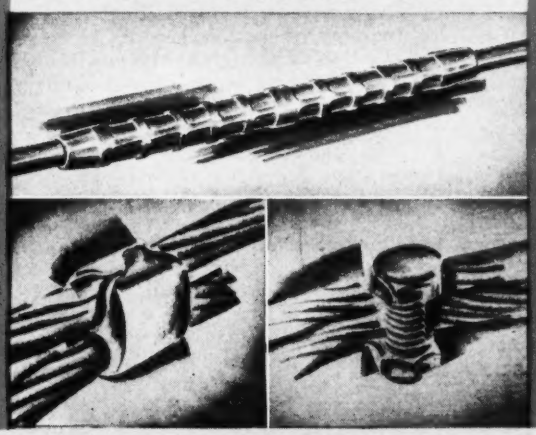
By making these four simple operations standard practice on every connection, you can depend on your connections to remain tight and trouble-free... yet easy to remove if necessary. You'll be saving yourself money and manpower for months and years to come.

Write Dept. A today for complete information on any or all of these System-Saving Kearney Products.

FOUR OPERATIONS

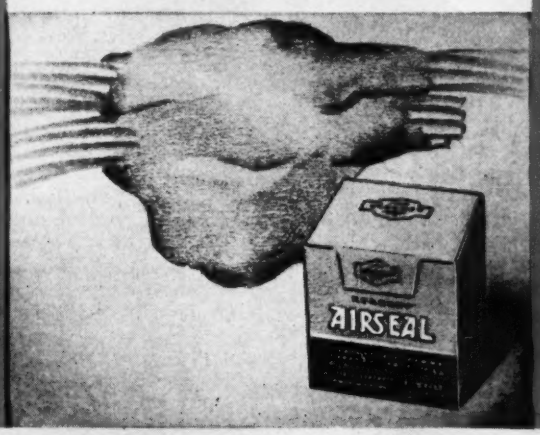
3

SELECT the right *Kearney Connector* for the job. A wide range of types and sizes provides economy and efficiency to meet every requirement:
Con-Nec-Tite Split Bolt Connectors
Squeezon Compression Connectors
Pressurite Two Bolt Clamps
Parallel Groove Clamps
Laptite Service Entrance Connectors
High Conductivity Splicing Sleeves



4

SEAL the connection permanently against air and moisture with *Kearney Airseal.* When kneaded around the connection, this high-dielectric compound forms a pliable, removable seal which prevents galvanic action in bi-metallic joints or oxidation in any connection. *Airseal* is supplied in 5 sizes of pads or rolls for fast, easy application.



PRODUCTS

For Better Construction... for **SAFER** *Maintenance*

JRK-235

Plummer Grayson

Richey Turner

Bateman Fanning

CMUA Discussed Power Contracts

Features of power contracts between publicly owned utilities and the federal government were discussed in three important papers presented before the annual convention of the California Municipal Utilities Assn. held in San Francisco, June 10-12, 1953. Practice of the Bonneville Power Administration in serving large loads within the area served by a public utility agency, at rates equal to or lower than the agency is paying for its own BPA power, is one of the inequities that should be rectified, said J. Frank Ward, superintendent of Tacoma City Light. The rate committee of the Northwest Public Power Assn., in preparing for a review of BPA rates in 1954, feels that there should be a differential of 15% to protect the agency against federal competition, according to Ward. It is further felt, he said, that the utility customers of BPA who have some generation of their own should share in the diversity created by reason of operation of the Northwest Power Pool in proportion to the extent to which they contribute.

Provisions of the 40-year contract recently entered into by the Sacramento Municipal Utility District and the Bureau of Reclamation for 290,000 kw of firm power were discussed by James E. McCaffery, general manager and chief engineer of SMUD. This contract was the result of negotiations between SMUD, the bureau and the Pacific Gas and Electric Co. The bureau's offer was 17% lower than that of PG and E and provides for a 10-year firm rate. The bureau has requested PG and E to wheel power to SMUD beginning in 1954. The district may have to spend $2,500,000 for additional facilities to insure continuity of delivery of Central Valley power if the PG and E and bureau do not agree on certain conditions. On a 60% average monthly load factor, the gross rate is 4.6 mills per kwh. A 5% discount for delivery at 115 or 69 kv can reduce the average rate to 4.37 mills per kwh.

Ivan L. Bateman, chief electrical engineer and assistant manager of the Los Angeles Department of Water & Power, presented an interesting history of all power contracts between various agencies and the government covering Hoover, Davis and Parker Dam power on the Colorado. Unlike other bureau power, the agencies buy falling water at Hoover Dam and operate the power plant. He reported that contractual and operating arrangements between all parties concerned had been most amicable.

Safety highlights in utility operations was discussed by William J. Stephens, East Bay Municipal Utility District; Lieut. William Potter, San Francisco Fire Department; Thomas Soule, Industrial Indemnity Co.; and Edward Hunt, Pacific Gas and Electric Co. They stated that utility purchasing agents should be familiar with equipment that conforms to the State Safety Orders. A stamp should be placed on all purchase orders for equipment stating that it must conform to these orders. All office equipment that is electric driven should be grounded. They also stated that attorneys for utilities should be thoroughly familiar with the State Safety Orders and be in a position to advise management on the application of the orders. Hunt said that 90% of the injuries are caused by human failure, and the other 10% by mechanical failure. Every utility's management should carry on an active safety training program. Emphasis has been given to incorporating accident prevention as an integral part in operation. That also means it should be incorporated as an integral part of design. Safety starts on the drawing board, said Hunt.

Eugene Carlton, of the State Department of Industrial Relations, Division of Industrial Safety, announced that a committee is being formed to investigate and report on present-day practices of loading of wires and cables and related apparatus. This committee will be composed of representatives from industry, electrical inspectors and utilities.

"Ae we return to normal, salesmen must learn to sell again and buyers must learn to buy; the effectiveness of the purchasing department under a returning free economy will depend, to a large extent, upon the support given purchasing by management," said H. R. LaFortune, manager, purchases and stores, Sacramento Municipal Utility District. If the purchasing department expects to play a vital part in this return to normalcy, then it should be understood that purchasing is not necessarily a service function but a profit-making activity and that it is best handled as a separate and distinct function with the real job of purchasing beginning long before requisitions or specifications are written. Purchasing should be represented in top operating councils, said LaFortune. He is of the opinion that escalator clauses will gradually disappear and said that it behooves all purchasing men to avoid their acceptance wherever possible.

In the matter of progressive or progress payments, he feels that the solution would be for those companies who are insisting upon such payments to quote two ways—one with progress payments, and the other without, and let competition take care of the situation. Reduction in inventory values is desirable, said LaFortune. This can best be done by materials management and study of inventory turnover.

At a business meeting, Lauren W. Grayson, Glendale Public Service Department, was elected president, and Carl Richey, Sacramento Municipal Utility District, vice-president. Glenn A. Baxter, Alameda Bureau of Electricity, and F. V. Frey, Pasadena Light and Power Department, were reappointed treasurer and secretary.

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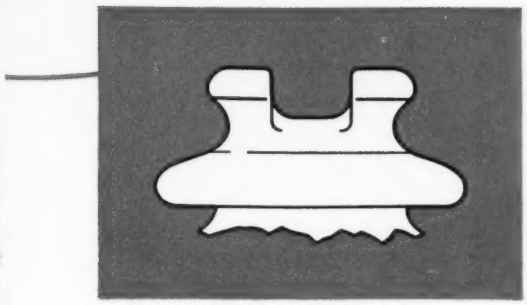

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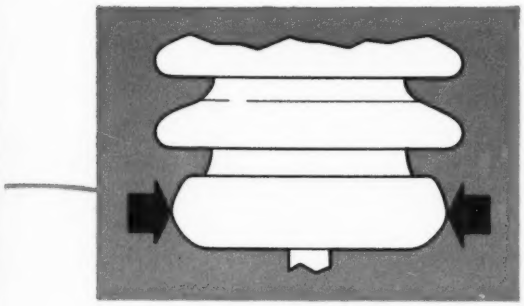

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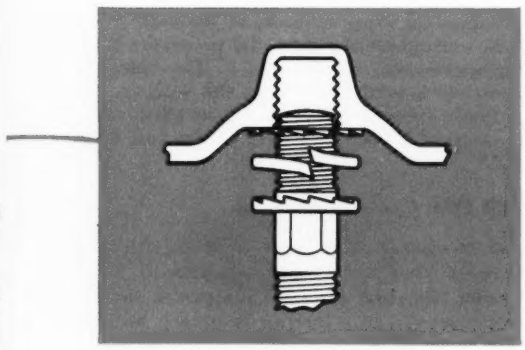

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THE MONTH IN BRIEF

PUC Postpones Merger Hearing

Washington State Public Service Commission postponed from June 15 to July 6 the second phase of its hearing on proposed merger of Puget Sound Power & Light and Washington Water Power companies; moved its location from Olympia, which was to be host to a convention on that date, to Seattle. The delay, plus the fact that stockholders must pass on the plan after 30 days' notice, made it unlikely that the merger could be completed by the July 30 deadline. On the other hand the PUD group, which has until July 31 to consummate its purchase, has two cases pending in court. Last month the Washington State Supreme Court took under advisement oral arguments in a case challenging the right of five PUDs to buy the properties. In this case, Ed Roehl, Wenatchee fruitgrower, maintains the 1949 law authorizing two or more PUDs to acquire private power facilities is unconstitutional because of the method by which it was enacted. Judge Jay A. Adams ruled against Roehl in the Chelan County Superior Court but, in appealing to the state supreme court, Roehl maintained that Judge Adams erred on 25 counts. Meanwhile WWP stockholders have voted to call 35,000 shares of $6 preferred, clearing the way for eventual issuance of a new $1.28 cumulative convertible preferred stock, which is one of the terms of the merger proposal.

Denver Utilities Now Under State PUC

In a special election June 16, Denver citizens, by a vote of approximately two to one, adopted a charter amendment placing regulation of privately owned utilities under the state PUC; turned down, three to two, a proposal for creation of a separate board of utilities commissioners for the city. As a home-rule city, Denver had not been subject to regulation by the state commission, created in 1913. (A 1950 compilation showed that the state PUD had jurisdiction over electric service to only 38% of the population.) Last fall Colorado voters defeated an amendment that would have given the state body authority over all utilities except those municipally owned and the Colorado Legislature in March voted to submit a similar proposal in 1954. Following the Denver election, Public Service Co. of Colorado officials stated that they felt "the placing of regulation of Denver utilities under the state commission goes a long way toward clarifying the entire regulatory situation in Colorado."

PUDs May Join in Hydro Development

Possibility that a group of Washington PUDs might undertake power development in the Columbia or Snake has been reported in the Northwest. Earl J. Cole, chairman of the Cowlitz PUD, has been discussing joint action on the Priest Rapids project with Nat Washington, attorney for the Grant PUD, which is planning two low dams in the Columbia, one at Priest Rapids and one at Beverly. (The PUD gave up plans for one high dam on objection of the Atomic Energy Commission and last month was informed by Harza Engineering Co. of Chicago that two dams can be constructed in the Priest Rapids area without sacrificing flood control benefits desired by the Corps of Engineers.) Attorney Washington reported his talks with Cole initially were aimed at getting Cowlitz support behind a Congressional bill to give Grant authority to go ahead at Priest Rapids; declared there was no general move afoot to solicit other PUDs or municipal systems into a joint program. A statement before the Oregon AFL convention that some PUDs were seriously considering joint efforts toward taking over construction of large hydro dams on the Columbia was later called premature by State AFL Secretary James T. Marr.

New Law Affects Soil Conservation Districts

California's Gov. Earl Warren has signed a legislative bill prohibiting soil conservation districts from entering into the power business. The bill, effective Sept. 9, provides that the some 60 soil districts in the state shall not have legal authority to conserve water for power purposes or to produce or distribute power.

Proposes Tax on Publicly Owned Utilities

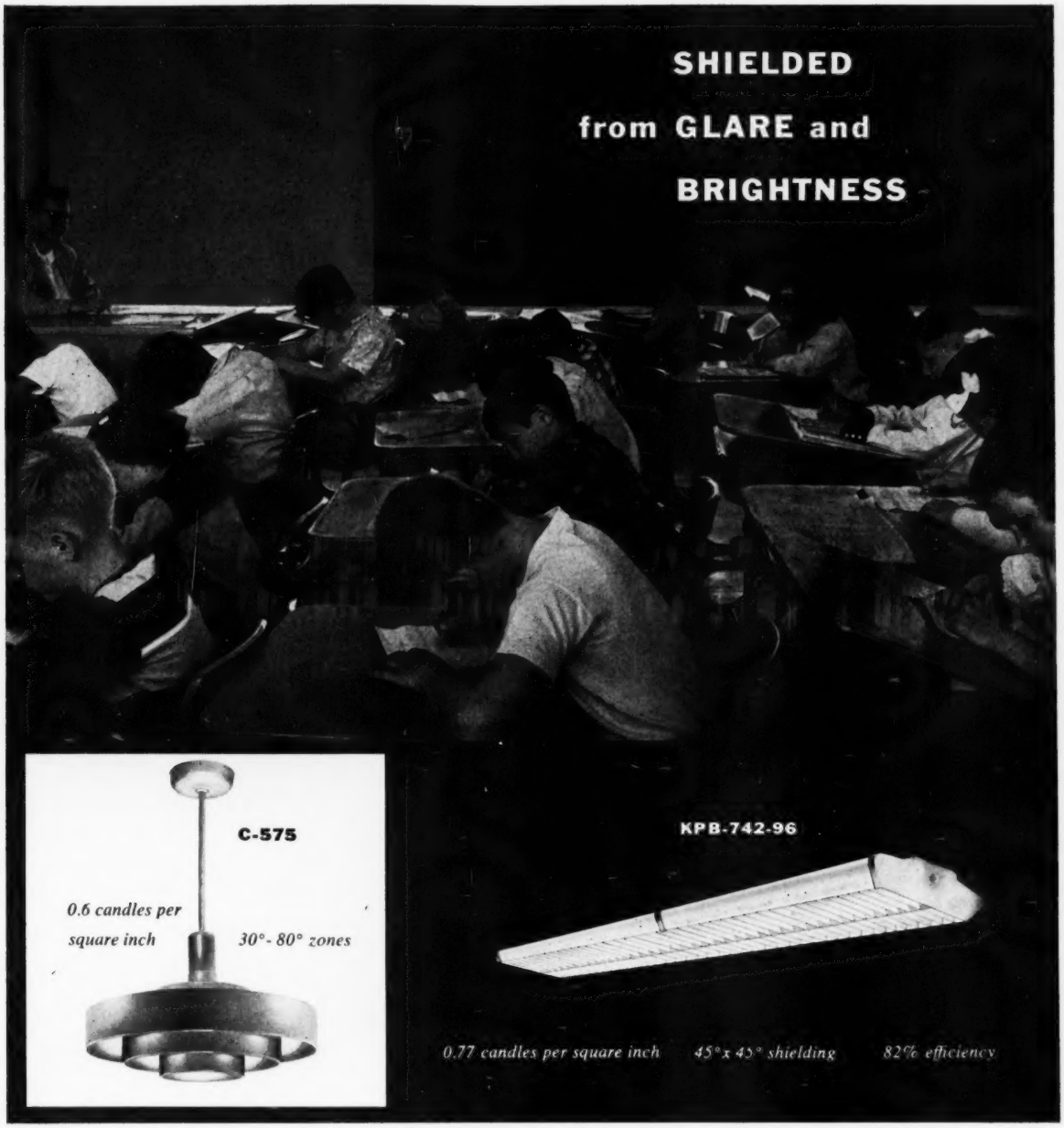
A proposal to tax publicly owned utilities was put before the California legislature by Senator F. Presley Abshire (R) of Sonoma County, who requested that no action be taken until an interim committee had made an intensive study. "The problem," Senator Abshire declared, "is the gradual whittling away of the local property tax by the exemption of substantial properties from private to governmental ownership . . . The question which we must try to settle is how far this socialization of property should proceed. What will be its effect upon the tax base upon which we depend to finance our local governments?"

Proposed BPA-PGE Contract Attacked

A proposed 20-year contract between Bonneville and Portland General Electric Co. was attacked by large aluminum, metal alloy and chemical companies and by public agencies (see p 128). Interior Secretary McKay replied to criticisms of this contract and his stand on Hells Canyon, when he spoke at dedication ceremonies for Detroit Dam in Oregon on June 10 (see p 132).

Steam Surcharge Hearings Recessed

Hearings on steam surcharges in the Northwest promised to stretch over several months, as Oregon PUC Commissioner Charles H. Heltzel recessed the case on June 17. Presumably hearings will be resumed in August. Oregon power companies probably will have to absorb about $627,000 of excess steam generating costs from last winter's hydro shortage, in addition to the $4,642,000 recovered from customers in the December-May period under the surcharge plan. Meanwhile in Washington, D. C., a Senate committee recognized the inequity; recommended that BPA enter into contracts with private companies for steam to firm up hydro in low-water years. (See p 130.)



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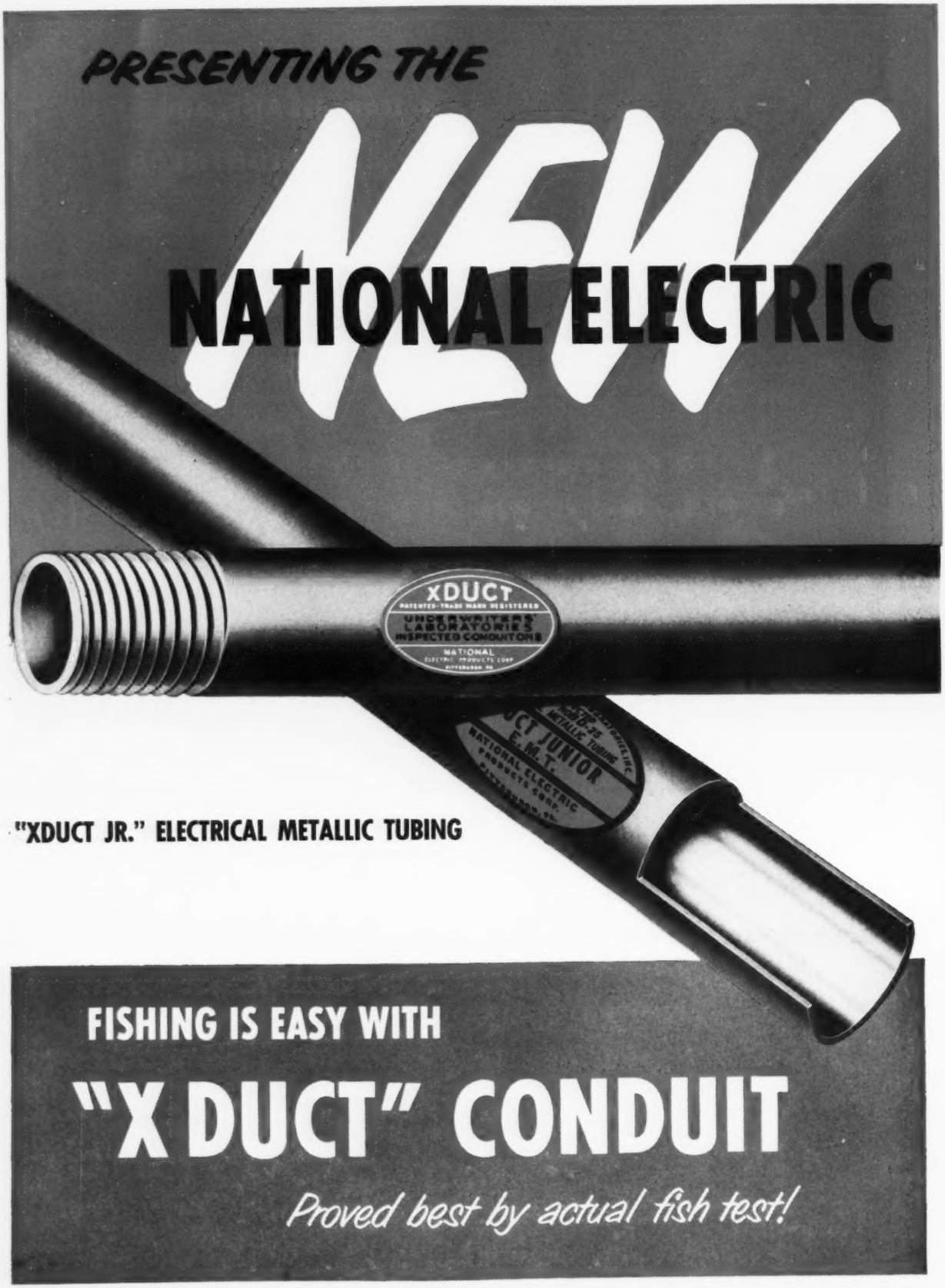
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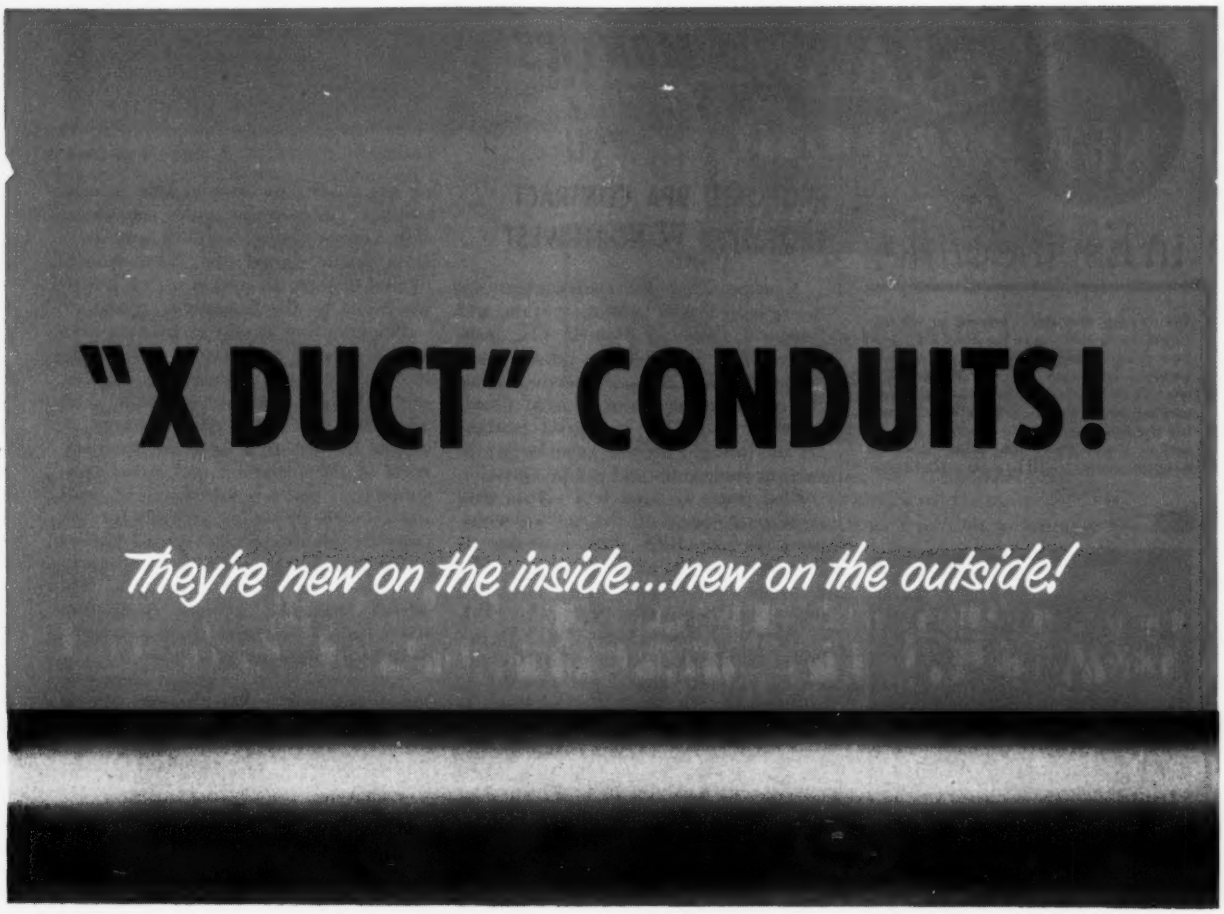

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THIS MONTH'S NEWS

PROPOSED BPA CONTRACT PROTESTED IN NORTHWEST

A proposed 20-year contract between Bonneville Power Administration and Portland General Electric Co., submitted for comment to power companies, public agencies having prior claims to power from federal developments and BPA industrial customers, has brought protests from large aluminum companies and public agencies.

One point at issue is a clause that requires consent of the private company before BPA can increase its firm power commitment to a public agency by 10,000 kw a year. The draft sets terms beginning Sept. 15, 1953, at BPA's wholesale rate of $17.50 per kw-yr and peaking demand at 75c per kw of billing demand per month; as adjustment for diversity in flow at points of delivery, the company will pay $0.01185 per kw of billing demand for energy and billing demand for peaking; resale provisions whereby BPA could terminate the contract on four years' notice if resale rates are considered unreasonable and discriminatory but with the purchaser able to ask for a review in the U. S. District Court of Oregon of any such cancellation; a clause that would prohibit BPA additions to direct industrial customer loads if it has not agreed to supply the private company's firm power requirements in the same period.

Major aluminum, metal alloy and chemical companies organized a committee; protested to Interior Secretary McKay that the contract would: (1) stipulate industrial contracts may not be renewed on expiration unless the industry agrees to reduce firm energy loads and assume certain costs of steam generation; (2) require prior approval of all private utility companies before any of the direct customers could expand; (3) impose a veto right by the private utilities over additional interruptible energy requirements of the electroprocess industries. Cities of Seattle and Tacoma joined other agencies in opposing the contract.

Interior Secretary McKay reiterated his policy, which he said contemplates equitable distribution of available power. (See p 132.) Answering Columnist Drew Pearson, he said that no contract that has been considered would by any stretch of the imagination turn all power from Bonneville or any other dam over to nine private utilities; no contract under consideration contemplates nor will any contract finally signed give the privately owned utilities an option on all power produced by the Bonneville system.

Commenting on clauses limiting new industry loads per year of PUDs taking energy from Bonneville, McKay said: "This appears necessary and advisable in view of the shortage of power in the area and the growing need of all domestic and rural consumers . . . There is a problem of finding enough power to provide for expansion but this applies to all parties alike — publicly owned, privately owned and industrial customers." He added that the private companies want something more than a month-to-month assurance of service.

There was little comment from private companies, though one official was quoted as saying that there "is little firm power involved" and a more important question would be resolving steam generating costs.

Idaho Power, BPA Renew Talks on Intertie

Idaho Power Co. and Bonneville Power Administration have renewed discussions on building a high-voltage intertie between the Northwest Power Pool's eastern group member and BPA grid in the western group affected by last winter's hydro shortage. Such a link has twice been knocked from BPA budgets by Congress and the federal agency didn't include the proposal in its fiscal 1953-54 plans. Whether the current talks will reach agreement is uncertain at present.

The intertie would be on the Baker-La Grange gap of 43 miles from BPA lines into Pendleton-La Grande, Ore. Idaho Power Co. has surplus energy in winter months, primarily from steam plants, and in the past winter of DEPA firm energy curtailment in the western pool the intertie would have allowed BPA to pick up some 75,000 kw. Other increments could have been brought out of Utah. The only existing intertie is a medium capacity line via Montana Power Co. through northern Idaho.

Talks in this direction were dropped about a year ago, but engineers continued correspondence on technical questions.

SENATE GROUP RESTORES PART OF FISCAL FUNDS

Oregon's Sen. Guy Cordon (R) last month won Senate appropriations subcommittee support to revise upward Bonneville operation and construction funds for the fiscal year beginning July 1. These proposals had been cut drastically by the House appropriations committee in April. (EWEST, May, p 134.)

The Senate committee restored $5,893,000 to construction, for a total of $44,193,000. The House had approved only $38,300,000. Funds for operation were upped $2,000,000 from the House figure of $5,000,000.

The Eisenhower-McKay budget originally called for $47,200,000 for construction and $7,100,000 for operation and maintenance. It was noted that BPA has an unobligated construction fund of about $3,000,000 from previous budgets.

Some 26 items were revised by the Senate committee. No major items approved by the House were omitted by the Senate but a few were trimmed: McNary-Walla Walla transmission from $985,000 to $808,000; the Midway-Moxee line in Washington from $564,000 to $512,000; McNary-Big Eddy-Ross transmission from $5,398,000 to $4,425,000. Omitted was $30,000 the House had set up for Kalispell, Mont., substation.

Other Senate recommendations (House recommendations in parentheses): Chief Joseph-Snohomish transmission lines 3-4 ($8,552,000) $9,078,000; Snohomish-Kitsap line (0) $2,605,000; Bellingham substation ($507,000) $388,000; The Dalles area service and McNary substation ($480,000 combined) $2,148,000 and $1,472,000 respectively; Southeast Portland area service ($1,705,000) $1,971,000; upper Willamette area service ($6,700,000) $6,867,000; Southwest Oregon loop service (0) $895,000; Coos Bay area service ($1,010,000) $1,610,000.

McNary-La Grande transmission (0) $278,000; Hot Springs-Spokane No. 1 ($536,000) $101,000; Shelton-Kitsap-Bremerton No. 2 ($426,000) $421,000; Ilwaco-Long Beach area service (0) $109,000; Clark County, Wash. ($83,000) $82,000; Tillamook area service ($463,000) $564,000; Eugene-Reedsport area service ($191,000) $237,000; middle Willamette River ($584,000) $962,000; Valley Way substation additions (0) $56,000; Idaho Panhandle (0) $114,000; Columbia Falls service area (0) $103,000; Midway substation additions ($380,000) $270,000; Grandview sub additions ($92,000) $40,000; other transmission ($306,000) $287,000.

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COMPANIES TESTIFY IN SURCHARGE HEARINGS

Testimony of an Oregon PUC accountant that he found no discrepancies in steam surcharge cost audits of five Northwest power companies including the three then under review was heard during last month's hearings in Portland. (EWEST, June, p 162.) C. G. Hieber, the accountant, reported he had checked the steam costs of the intercompany pool at Spokane headquarters and also those of the Oregon companies.

The hearing was recessed, presumably until August, on June 17 after nine days of testimony, spread over the period between the opening June 3 and the recess date.

PUC Commissioner Charles H. Heltzel rejected the motion of the three companies for dismissal on grounds that the record was not complete and more testimony was needed. Their attorneys will call witnesses to fill in gaps on technical questions raised by the complainants when the hearing resumes.

Heltzel took under advisement a motion of Rep. Monroe Sweetland's attorney, Walter Evans Jr., to amend the complaint to include a charge that the surcharges were illegal under Oregon statutes. So far the proceedings have been on Sweetland's complaint that they were unfair and discriminatory and, as originally amended, increased the private companies' earnings above normal return on investment permitted by law.

He dismissed complaints against Mountain States by Thomas Rickman and Vincent M. Savelich of Springfield, noting neither had appeared or been represented. He took under advisement a company motion that the Northwest Public Power Assn. be eliminated as an intervenor on the side of the complainants since it is a Washington corporation and its representatives did not participate in the Portland hearing.

The hearing stretched out as complainants sought to delve exhaustively into affairs of Portland General Electric, Pacific Power & Light and Mountain States Power companies. Heltzel denied a renewed motion to have the companies bear the burden of proof of validity and reasonableness of the surcharges; refused a move by the complainants to have the commission accept and ask 37 interrogatory questions. In refusing, Heltzel placed the hearing upon what he called the normal procedure of testimony and arguments by the parties. Attorneys for the companies had protested that many questions were immaterial, calling for rate data back to 1940 in some instances.

In his opening statement, PUC Counsel Mills declared the relief that Sweetland asks does not concern surcharges but calls for examination of rates, schedules and tariffs and the basis on which they are determined. "It seems all we have left is a rate case," he stated.

A question of whether Heltzel should disqualify himself as examiner because of testimony before a U. S. Senate appropriations committee last April was raised by Evans. Heltzel answered that he had testified relative to surcharges only to the action by his office in 1951 in authorizing surcharges.

Steam Contracts Suggested During Low-Water Years

In Washington, D. C., the Senate appropriation committee on June 18 recommended that Bonneville Power Administration enter into contracts with steam-generating operators to supplement hydro in low-water years. The committee noted that the low year of 1952 had "resulted in the imposition of an inequitable burden of costs upon a very large group of domestic and rural consumers . . ."

Prepared by a subcommittee headed by Sen. Guy Cordon (R) of Oregon, the report expressed the belief that "the situation can and should be corrected by the Bonneville Power Administration entering into contracts to firm up, in low-water years, its power delivered for the benefit primarily of domestic and rural customers, by the acquisition to the extent necessary of available steam-generated energy in the area and the resale of such energy to the agencies distributing Bonneville power for general-purpose use under the schedule now applicable to Bonneville sales."

It was made clear, however, that the committee did not want its recommendations interpreted as indicating belief that BPA had authority to enter into contracts generally for the purchase and resale of steam power. But when "limited to making more dependable during critically low-water periods only the normal productive capacity of the federally owned hydroelectric plant . . . such contracts are in the interest of the over-all economic operations of the project and in conformity with the Bonneville Act," the statement continued. "It is our view that this end can be achieved by an exchange on an equitable ratio of the government's hydro for the steam-generated energy necessary to be acquired."

HELLS CANYON REPORTS RELEASED BY INTERIOR

That the Hells Canyon multiple-purpose project, with large storage and downstream benefits, would be superior to the three-dam development plan of Idaho Power Co. was the opinion expressed by John S. Cotton, San Anselmo, Calif., consulting engineer and former FPC chief of water power and river basin investigations in 11 Western states, in a report to Interior.

The 91-page report was released June 18 on order of Interior Secretary McKay, who had been accused of suppressing it and other data. (See p 132.)

Interior Solicitor Clarence A. Davis denied that reports were suppressed and made public a letter to FPC Chairman Jerome C. Kuykendall in which he said Interior would file four reports: Cotton's, one by Raymond A. Hill, Los Angeles consultant (who investigated possible depletion of the Snake's flow by expansion of the area of irrigated land above Hells Canyon; concluded it would be unimportant); one by J. R. Ritter, chief of hydrology branch, USBR, Denver, and a fourth by Lynn Crandall, district engineer, U. S. Geological Survey, and Snake River Watermaster of Idaho's Department of Agriculture.

T. E. Roach, Idaho Power Co. president, offered no rebuttal; observed that "with the hearing before FPC just two weeks off (July 7), it would be improper to publicly debate the merits of the Cotton report. We prefer to present the answers to this and other reports favoring federal construction of Hells Canyon by formal testimony under oath before the commission."

Contracts Awarded for Chief Joseph Dam

The Corps of Engineers has awarded two contracts totaling $6,010,918 for equipment to be installed in the power house at Chief Joseph Dam on the Columbia River in north central Washington.

The larger award, for $4,249,601, went to Westinghouse Electric Corp. for furnishing the second group of four 67,368-kva a-c generators.

The other award, for $1,761,317, went to the English Electric Export & Trading Co. Ltd. of England for ten 103,300-kva transformers. This firm was underbid June 1 by Westinghouse for the larger contract, after figuring low in an earlier opening.

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McKAY STATES POLICY AT DETROIT DEDICATION

Back in his home state to dedicate Detroit Dam in the Willamette Valley of Oregon, Secretary of the Interior Douglas McKay stated his position on river development in the Northwest and on federal power contracts. (He had been criticized by public power advocates for his stand on Hells Canyon and aluminum companies had expressed doubts about a proposed BPA contract with private utilities.)

"My grandparents were pioneers in this country. All I have I owe to this region. I would never do anything to hurt it," he declared at the June 10 dedication ceremony.

"There may be some who have ideas that may differ with my own. But rest assured that as long as I am Secretary of the Interior any contract which is signed in my administration will be based on equity—equity to the government, equity to the taxpayer and equity to the consumer.

"These contracts will guarantee full protection to the public of its rights, and be fair and equitable to the companies and large industrial users which buy much of the power."

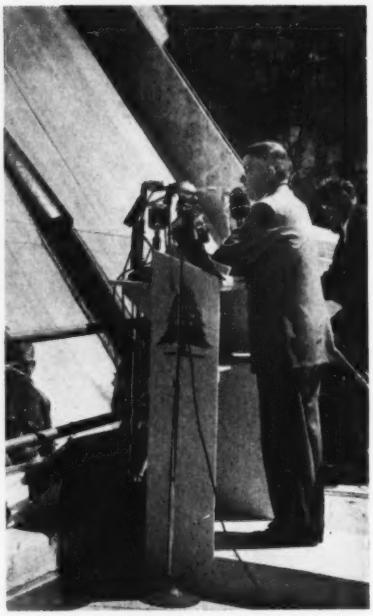
He said that he considered Detroit Dam "a symbol of the idea that there is room in the Columbia Basin for public and private power, just so long as the agreements we reach between them are worked out in such fashion as to bring forth the maximum benefits to all."

The $70,000,000 project is the fourth major structure of the Willamette Basin program, aimed primarily at flood control. It will have two 50,000-kw hydrogenerators for winter season peaking and is the first federal dam on the Willamette to have power facilities. Built by the Army Engineers, it rises 454 ft and stretches 1,528 ft between North Santiam River cliffs.

Sharing in the dedication were Maj. Gen. S. D. Sturgis Jr., chief of engineers of the Army Corps; Col. Thomas H. Lipscomb, Portland district engineer; Gov. Paul L. Patterson of Oregon and Gov. Len Jordan of Idaho.

The day after McKay made his dedication speech at Detroit, the Oregon Grange, meeting in Medford, voted without dissent a resolution "emphatically condemning" the Secretary of the Interior for "wrecking comprehensive river development" by his Snake River decision; accused McKay of suppressing key information on the Hells Canyon site and demanded these data be made public.

U. S. Senator Wayne Morse, who spoke June 12 as an Independent at the Jefferson-Jackson banquet of Oregon Democrats in Portland, declared himself wholly on the side of public power partisans and lashed at McKay.

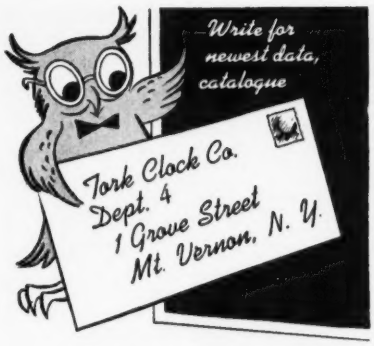


Interior Secretary Douglas McKay was in the West last month to dedicate Detroit Dam on Oregon North Santiam River. As governor of Oregon in 1950, he poured the first bucket of cement for this Army project, fourth major unit to be completed in the Willamette Valley flood control program and the only one with hydro features

City of Centralia Hydro Plans Given FPC Okay

The Federal Power Commission has approved plans by the City of Centralia, Wash., to expand its hydroelectric plant on the Nisqually River at an estimated cost of $1,400,000 according to word received at Centralia by Reid Conrad, city finance commissioner. The commission's decision that no hearing would be required clears the way for the project, for which equipment bids already have been called. It will double the present 5,000 kw capacity of the plant. The city has about $500,000 on hand for the project and will obtain the balance on a six-year bank loan.

● **USBR's** Region 2 office in Sacramento, Calif., is being converted to a more restricted purpose—headquarters for the bureau's Central Valley Project. The new office will report to Washington, D. C., headquarters and will not be under supervision of any other region.



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UTILITY ASSESSMENTS HIGH, COLORADO BOARD FINDS

Public utilities in Colorado are being assessed at a higher percentage of their value than are other properties, according to A. G. Mott of Pebble Beach, Calif., who was employed by the Colorado Board of Equalization to make a study of the state's tax situation.

Mott's study stemmed from complaints of taxpayers, mostly from rural areas, over the new valuations fixed in a reappraisal program last year. Many of the complaints had alleged Colorado utilities were not bearing their share of the tax burden in comparison with rural properties and real estate.

The expert reported that "state-assessed properties (utilities) on the whole are bearing somewhat more than their fair share of the tax burden."

Mott said his examination showed that utilities are assessed at 42% or more of their market value. The Colorado Tax Commission says the assessment is about 50% of the market value.

"It is unlikely that current real estate assessments are, on the average, in excess of 40% of the current market values," Mott said. He added they might be substantially lower.

Mott, who received $150 a day for his two-week study, expressed doubt of the constitutionality of Colorado's method of assessing utilities. Colorado law requires fixing an overall valuation of utility property and then assigning percentages of that figure to each county. These are based upon the miles of power lines, telephone lines and track within the border.

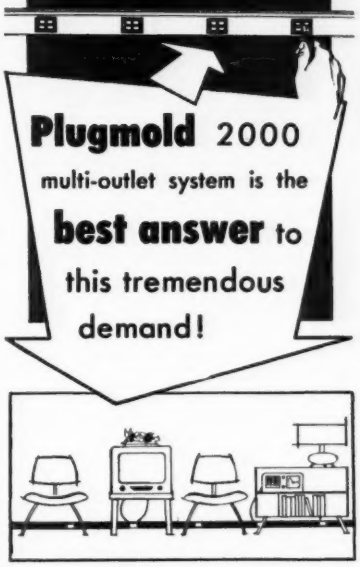
Mott declared "the value of these properties arises out of many more factors than merely the existence of railroad tracks or telephone lines or power lines."

His report said "the constitutionality of the Colorado utility assessments would be better assured if the statutory allocation formulas were revised or the Tax Commission were given some discretion to use formulas other than those prescribed by law."

Mott's findings were checked by two other tax experts, George W. Mitchell of Chicago, vice-president of the Chicago Federal Reserve Bank, and Ronald W. Welch, Sacramento, economist for California's State Board of Equalization.

● **City of Seattle** awarded a contract for 67,000 ft of lead-covered paper-insulated cable to the W. T. Henley Telegraph Works Co. of London for $103,127.

All over the country people **want** more outlets!



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HYDRAULIC ENGINEERS MEET IN PORTLAND

Hydraulic engineers of 14 states participated in the 1953 Edison Electric Institute hydraulic power committee conference in Portland, June 15-17. Four technical papers were read and the group toured hydroelectric projects of the Columbia River and its tributaries.

Committee sessions were in charge of Hibbert Hill, Northern States Power Co., Minneapolis, Minn., chairman; G. E. Watkins, Edison Electric Institute, New York City, secretary; and Corbett McLean, engineering supervisor for Pacific Power & Light Co., Portland, who handled conference arrangements for the host utility.

Conference papers were by E. A. Crellin, general superintendent for hydrogeneration of Pacific Gas and Electric Co., San Francisco, who presented a discussion of "Draft Tubes and Gate Experience" comparing the different types, their efficiencies and reduction of vibration and cavitation; E. B. Strowgerm, chief hydraulic engineer, Niagara Mohawk Power Corp., Buffalo, N. Y., on "Computing Flood Flows for Spillway Design"; E. Robert de Luccia, vice-president and chief engineer of Pacific Power & Light Co., Portland, on his company's Yale project on the Lewis River in Washington; a report of the Artificial Precipitation Committee which concluded after some three years of studies that artificial methods of inducing rainfall have not conclusively proved their claims. The committee report made a point of the weather cycles and noted 1936-37 was apparently the low point of a dry cycle and precipitation appears to be on the increasing slope of another cycle.

Frank L. Beadle, superintendent of construction, Pacific Power & Light Co., shows facilities at the company's Yale plant to George E. Watkins (left), Edison Electric Institute, New York City, and Hibbert Hill, Northern States Power Co., Minneapolis, Minn., chairman of the hydraulic power committee conference held in Portland last month. E. Robert de Luccia, a conference speaker, had told about the development

● **Columbia basin** water resources for the summer and the winter months ahead have been revised sharply upward because of near record rainfall in May and continued cooler temperatures and rains into mid-June. The forecast change was read to members of the Interagency Committee meeting in Bend, Ore., June 10-11 when the Portland River Forecast Center reported another foot—up to 21 ft—could be expected on the spring freshet crest of the Columbia at Portland. It will mean full reservoirs for most of Pacific Northwest hydroelectric dams and higher levels at storage structures upstream.

● **Tacoma**, Wash., City Council, elected under a new charter which calls for appointment rather than election of the utilities commissioner, retained C. A. Erdahl, present utilities commissioner, as temporary director of public utilities for the month of June. It made this decision after an appeal from the Chamber of Commerce, which described June as "a crucial period in the power program, demanding that Tacoma have an experienced representative in the development of an electric generating program. Permanent appointment to the post will be made by a utilities commission to be named by the mayor.

Power Company Booklet Tackles Tree Problem

As part of its program of public education to help solve the shade tree problem, Pacific Gas and Electric Co. has published an illustrated booklet, "Trees to Fit Your Home and Your Street."

The attractive booklet, containing photographs in full color of 20 recommended trees, as well as a list of trees to be avoided because of bad growing habits, is being presented to city and county officials, park superintendents, landscape architects, real estate developers, garden and improvement club officers and other key people in the company's service area.

The center color section will be distributed to the public through PG and E local offices.

In addition, a set of film slides has been prepared as the basis of illustrated lectures, which will be offered for organization programs.

In its attempt to educate the public on planned tree planting, the company is cooperating with arborists and horticulturalists. Booklet, film slides and all details have been developed with the collaboration of the Saratoga Horticultural Foundation, a shade tree experiment station in Santa Clara County, Calif., and leading arborists. The company's program was endorsed recently by resolution of the Twentieth Western Chapter National Shade Tree Conference in session at Santa Monica, Calif.

● **Officials** of the San Diego Gas & Electric Co. have signed a contract with a group of 62 underwriters for sale of 800,000 shares of new common stock expected to yield the company about $10,500,000 of new capital. The funds will be used for the firm's current expansion program, and about $5,000,000 will be earmarked for completion of the $18,000,000 first unit of the Encina generating plant expected to go into service in August 1954. Directors voted to offer the new shares first for purchase by present stockholders at a price of $13.30 a share.

● **A transformer reference book** containing 33 articles for engineers has been issued by Allis-Chalmers Mfg. Co. Originally published in the manufacturer's *Electrical Review*, the articles have been brought up to date with new pictures and charts where necessary. Purchase price of the 170-page volume is $1.

● **Pacific Power & Light** Co. has been authorized by FPC to issue and sell to its employees up to 15,000 shares of no par value common stock.

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AUTHORITY GIVES REPORT ON STATE CVP PURCHASE

Cash payment under a revenue bond issue would be just as advantageous a method for the State of California to acquire the Central Valley Project from the federal government as purchase on the installment plan, the California Water Project Authority concludes.

The authority submitted a preliminary report to the legislature in response to a resolution asking that a study be made of the feasibility of buying the project on the installment plan. The report was prepared under the direction of State Engineer A. D. Edmonston.

Previous studies indicated state ownership would be feasible under certain assumed conditions, including the marketing of power at estimated market value. Studies are now being made, the legislature was informed, to determine whether state acquisition remains feasible under other plans, if power continues to be sold at rates which are considered to be below open market value.

Present power contracts between the U. S. Bureau of Reclamation and 24 public agencies have rates considered by the state engineer to be below market value.

One of these contracts is with the Sacramento Municipal Utility District, effective June 30, 1954, with a rate of 4.65 mills a kwh. State Engineer Edmonston in his computations used a figure of 7 mills a kwh as the basis for computing power revenues under state operation.

"Studies and analyses are being continued with reference to the feasibility of state ownership and control of the Central Valleys Project using other criteria and assumptions, including other rates for electric power and methods of its disposal," Edmonston said. "It is believed, however, that the results of those studies will not alter the previous finding that under either cash or installment purchase plans the cost to the state and the net return to the United States would be approximately the same. If one plan is financially feasible, the other would likewise be feasible."

The capital costs of units of the project constructed or under construction that are considered for acquisitions from the federal government under the initially authorized project are estimated to be $364,706,000, which with the inclusion of the Folsom Dam Project makes the total $456,156,000.

State law, the report says, is deemed adequate in connection with acquisitions, financing, operation and maintenance of the properties by the authority but present provisions of the federal reclamation laws are inadequate to authorize the execution of an appropriate contract by the Secretary of the Interior with the authority for the acquisition of the CVP by the state and action by Congress is required to authorize a transfer of title to the state.

California's Legislature Studies Water Agency Bill

The California Legislature adjourned June 10 without approving a much discussed bill to consolidate most of the state's water agencies into a single department.

The bill passed in the assembly and in the senate and had been returned to the assembly for action on senate amendments when the author, Assemblyman Ralph Cloyed (R) of San Diego County, announced he was dropping the legislation because of the opposition of Gov. Earl Warren.

The governor voiced his disapproval of the bill because it contained provisions changing the state's water laws.

Under the Cloyed bill the water department would have included the division of water resources in the State Department of Public Works, the Reclamation Board, the District Securities Commission, the Colorado River Board and the Water Project Authority.

The State Water Pollution Control Board, its nine regional boards, San Luis Rey Water Authority and Bureau of Sanitary Engineering, Department of Public Health, would not have been included.

The California Legislature decided further study was needed for a proposal to create a public water conservation district with the power to construct a vast system of water storage and power dams in three northern California counties.

The plan was proposed by Assemblyman Francis Lindsay (R), representative of the counties in the legislature.

Lindsay envisioned a $150,000,000 development on the American River and its tributaries in the Sierra Nevada above Folsom Dam, which is being built by the federal government. His measure proposed the issuance of bonds to finance the program.

The bill cleared one committee and was pending on the assembly floor where Lindsay dropped plans to push it because of "considerable opposition." Lindsay announced he hopes a legislative committee will devote considerable study to the proposal between now and the 1955 session.

DIP INTO THE PAST

We have duplicate sets of the following back issues of ELECTRICAL WORLD magazine:

Vol. LXXV
January-June, 1920

Vol. LXV
January-March, 1915

Vol. LXIV
July-December, 1914

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EDISON ASKS RATE INCREASE; FIRST IN THIRTY-TWO YEARS

California PUC hearings began in Los Angeles last month on Southern California Edison's first application for a rate increase since 1921.

Edison is asking permission for a complete revision of its rate schedules. If granted, the new rates will bring an estimated $16,000,000 increase in annual revenues, based on 1952 sales. Average household user's bill, according to Edison, would be upped about 25c a month; most commercial users would pay about $1.15 more a month.

Edison officials told the commission that the company is operating during an inflationary period on a "preinflation dollar." They pointed out that after the last increase 32 years ago Edison cut its rates numerous times, last in 1946. Meanwhile cost of materials has more than doubled since 1939; company salaries and wages are more than 230% over the base period 1935-39; tax rates and plant improvement costs have greatly increased.

They maintain the company cannot meet these higher costs without an increase in rates and still give a return to investors that will attract the new capital necessary to maintain increased service.

After five days of hearing Edison's case, the commission was scheduled to hear individuals and groups protesting the application. Two protestants are the Pacific Electric Railway and the Los Angeles Transit Lines.

The two transportation lines said they would argue that any boost in electric rates would place an unfair burden on companies using electricity for a major part of their operations. LATL said its financial burden would be increased $200,000 annually if the new rates become effective.

● **Interior** has approved a 10-year extension of San Francisco's contract with Pacific Gas and Electric Co. under which PG and E distributes power to certain large-order Hetch Hetchy customers. PG and E distributes Hetch Hetchy power to the municipal departments, Kaiser cement and magnesium plants, the Riverbank Ordnance Depot and the Modesto-Turlock Irrigation District.

● **Southern California Edison** is negotiating for a 500-acre tract along the San Gabriel River flood control channel just east of Long Beach, Calif., as a future site for a steam generating plant. Arrangements are also being made for transmission line rights-of-way northward along the river from the tract.

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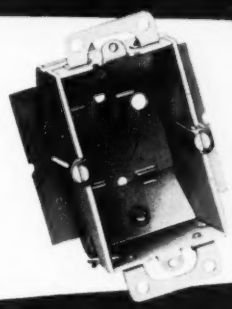

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NOTES ON THE TRADE

● **T. M. Cole,** president of Federal Electric Products Co. of Newark, N. J., last month visited the plants of Pacific Electric Mfg. Corp. in San Francisco and Santa Clara, recently acquired by Federal Electric. Pacific Electric management, headed by **J. S. Thompson,** president, is continuing to operate the California plants, which manufacture high-voltage equipment. Federal Electric products are primarily of the low-voltage type.

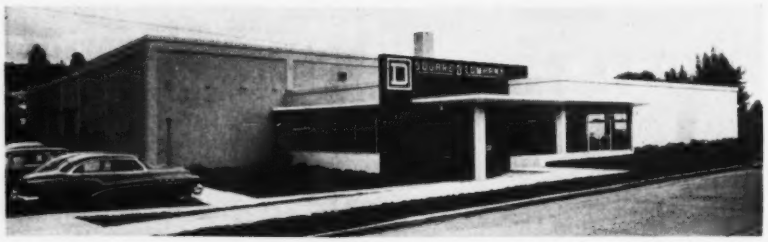
● **Thomas A. Mollard,** formerly electrical engineer in the control and systems department of California Research & Development Co., has joined Herman E. Held, manufacturers' representative, as a sales application engineer, with headquarters in San Francisco. He received a BEE degree at the University of Santa Clara in 1950.

● **Four Westinghouse** manufacturing and repair division plants in the West have received 1952 awards from the National Safety Council for their records in accident prevention. Plants in Sunnyvale, Seattle, Portland and Salt Lake City received awards based on accumulated accident-free hours of operation.

● **Electric Corp. of California,** Los Angeles, has been appointed a Westinghouse Electric Corp. agent-distributor and will sell a complete line of apparatus in Los Angeles, San Luis Obispo, Kern, Inyo, San Bernardino, Orange and Riverside counties. Ross Hartley is president and treasurer of the distributing company.

● **Stephen Babcock** of Manufacturers Marketing Service has taken over the Miller Co. representation formerly handled by the late Al Bergeron, who died in May. This line is handled by MMS but Babcock will take on personal representation for northern and central California.

● **Leadlight Fixture** Co. is the new name of what was formerly known as Leader Electric-Western, the lighting division of Oakland Engineering Co. Inc., an independently owned company that was licensed to use Leader designs. The purchase of Leader by Benjamin, Milton Kosman, manager, explains, does not involve what is now known as Leadlight Fixture Co., whose address is 800 100th Ave.. Oakland. Leadlight is a member of RLM and a licensed Holophane fluorescent lens distributor, selling only through jobbers. A new price list and catalog will soon be available.



Square D's new Seattle plant was officially opened last month at a luncheon in the Washington Athletic Club. In conjunction with the plant, it was announced that new sales coverage has been set up, with offices in Portland and Spokane. Whether the equipment is simple or complex, design and assembly will be handled by the field sales, engineering and production organization now available in the Seattle district, according to J. H. Pengilly, Square D vice-president, who told of company progress in the Northwest

At the Square D luncheon were: Phil Strack, president of Seattle Chamber of Commerce; L. G. Maechtlen, sales manager of company's Western Division; Allan Pomeroy, mayor of Seattle; Vice-president Pengilly; Dan Miller, company's Northwest district manager

● **Welding Products Division** of the A. O. Smith Corp. has appointed Worland Oxygen Co., P. O. Box 730, Worland, Wyo., a distributor of welding electrodes, welding machines and accessories.

● **Rockbestos Products** Corp. has moved its Seattle office from 1908 E. 135th St. to Room 314 in the Lloyd Bldg. at Sixth Ave. and Stewart. Manager of the office is **Robert Keay.**

● **The Permutit** Co. has moved its Los Angeles sales office to 302-B S. Brand Blvd., Glendale 4. **George A. Swem** is industrial sales engineer and **J. H. Mosher,** Pacific Coast regional manager, heads household sales.

● **Jongeward Electric Motors** Inc., 715 8th St., Yuma, Ariz., has been appointed distributor for Allis-Chalmers General Machinery Division.

● **Campbell & George** Co., northern California manufacturers' representative, has announced the addition of two new members of the partnership. They are Ray Anson, for 15 years San Francisco branch manager of Square D Co., and M. L. "Bob" Fowler, manufacturers' agent in the San Francisco area. For several months the two men had been operating as the Anson-Fowler Co., representing Roller-Smith Corp., Heinemann Electric Co. and the Feedrail Corp. These lines are being added by Campbell & George, which also represents Allen Bradley Co., Automatic Control Co., Eagle Signal Corp., Sorgel Electric Co., Lexington Electric Products Corp., Helwig Co. and Counter & Control Corp. Firm headquarters are at 279 Brannan St., San Francisco 7.

● **Ampex Electric** Corp. of Redwood City, Calif., manufacturer of magnetic tape recorders, has opened a district sales office at 100 Bush St., San Francisco. **Jack Hauser,** formerly with Minnesota Mining & Mfg. Co., will head the new office.

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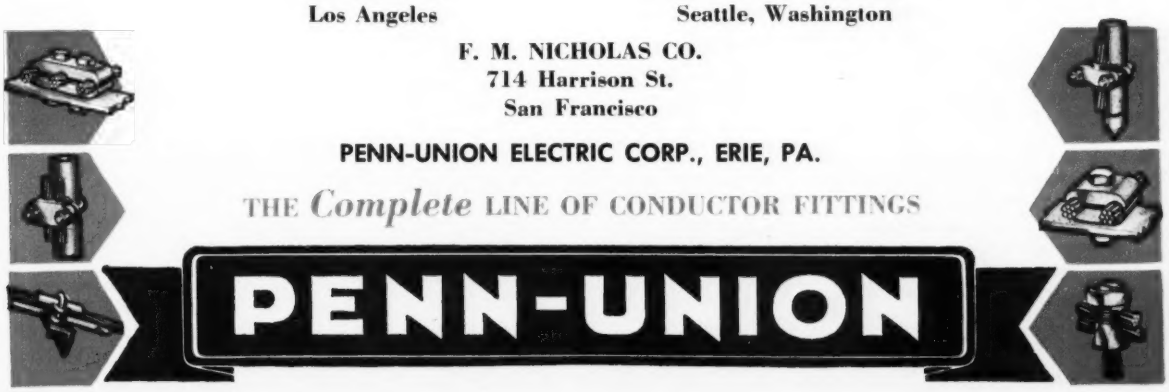

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NEWS ABOUT PEOPLE

● **Hawaiian Electric** Co. has appointed **L.W. Lengnick** a vice-president. As vice-president and executive engineer he will have supervision over generation, distribution, system operation, engineering and general service.

● **Resignation** of **Richard L. Boke** as USBR regional director at Sacramento became effective June 30. Boke had been in federal service for 20 years, nearly eight of them as director of USBR's Region 2. He will enter private business.

● **Adolph J. Erickson,** former manager of the San Francisco office of Combustion Control Corp., has been made Dallas, Tex., area office manager. Before his association with Combustion Control he was with PG and E as plant engineer and C. C. Moore & Co. as service engineer in San Francisco.

● **Ben B. Lezin,** consulting electrical engineer, has moved from the Seattle area, where he had been located for 18 years, to San Francisco and has opened offices in the Phelan Bldg. Recently he has handled electrical design on several major hospitals and commercial establishments in the Northwest. Previously he was supervisor of electrical design, Public Works, Navy Department.

● **Lt. Col. J. W. Howard,** General Electric Lamp Division, who has been on leave to complete his second tour of duty with the Armed Services, was discharged recently. Formerly district lighting engineer at Los Angeles, he was transferred to San Diego.

● **Stacy Standley,** formerly in the West, has been promoted to manager of Line Material lighting sales with headquarters in Milwaukee. He started with the company on the West Coast and later was in the Mountain States Division.

● **Harold Quinton,** executive vice-president and director of Southern California Edison Co., has been elected vice-president of the Edison Electric Institute.

● **E. S. Bjonerud** will be manager of industrial sales for General Electric's Apparatus Division in the San Francisco area. He formerly was assistant manager of industrial sales.

● **James K. Carr** has been appointed consulting engineer for the Sacramento Municipal Utility District. A resident of Washington, D. C., for the past several years, Carr formerly was the Sacramento Valley district manager for the Bureau of Reclamation. He resigned to accept a position as administrative assistant for a house of representatives subcommittee on public lands. James E. McCaffrey, general manager and chief engineer of SMUD, said Carr will remain in Washington temporarily for certain work for the district with the Federal Power Commission, Rural Electrification Administration and USBR. Carr will direct the SMUD power supply activities.

● **Russel B. Caples,** manager of Anaconda's Great Falls, Mont., reduction department since 1941, has been elected president and director of Anaconda Aluminum Co. He succeeds Francis O. Case, resigned. Caples will make his headquarters in New York but will continue to manage zinc contract negotiations in Montana.

Deaths

● **J. F. MacAllister,** residential development director for Utah Power & Light Co., Salt Lake City, died June 10, aged 62, following a lingering illness that had kept him inactive several months. He had been with the company since 1917, most of the time in residential sales. In 1949 he was chairman of the Business Development Section, NWEI &PA, and in 1950 he served as president of Intermountain Electrical Assn., on both of which he had been on many committees.

● **Walter K. Boyd,** editor of *Intake,* Los Angeles Department of Water & Power employee magazine, died June 13, as the 354th issue of the magazine was going to press. He was born in Anderson, Ind., in 1900 and moved to California in 1928. He joined the department in the Public Relations Division in 1933.

● **Lynn B. Orme,** 80, Central Arizona pioneer and one of the incorporators of the Salt River Valley Water Users Assn. and Power District, died at Phoenix, recently. A resident of the valley since 1879, he had held every elective position in the association since helping organize it in 1903.

● **Frank E. "Turk" Morrow,** assistant line superintendent for Southern Colorado Power Co., 43 years with the company, died of cancer, May 15 in Pueblo. He was a well known character in Pueblo.

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PROFILES

Bateman Kenyon
Changing the guard at L. A. Electric Club

Ivan Bateman, recently named chief electrical engineer, Los Angeles Department of Water & Power, ended his year as president of Electric Club of Los Angeles June 8 and turned over the gavel and prerogatives (fines to you) to R. G. "Spike" Kenyon, vice-president, Southern California Edison Co., who will preside for a year. Three vice-presidents elected were: R. E. Johnson, G-E; Carlisle Bailey, Newbery Electric; S. M. Johns, Westinghouse Electric

Liecty

Engel

During the past few months, promotion has come to these members of the electrical industry in the West: Richard L. Engel, formerly Allis-Chalmers representative in Los Angeles, was named manager of that district office to succeed Richard D. Moody, now Rocky Mountain region manager. Arizona Public Service Co. made John T. Kimball and A. H. Forman Jr. executive vice-presidents, in charge of sales and service and planning and promotion respectively; gave John L. Liecty, treasurer, added duties as head of financial and accounting group

Kimball

Forman

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Oerlikon low-oil-content, porcelain-clad circuit breakers are simple and rugged. Components are light and easy to handle. Maintenance is uncomplicated and economical. With excellent performance under all operating extremes, these *West Coast Produced* circuit breakers provide maximum safety against all hazards.

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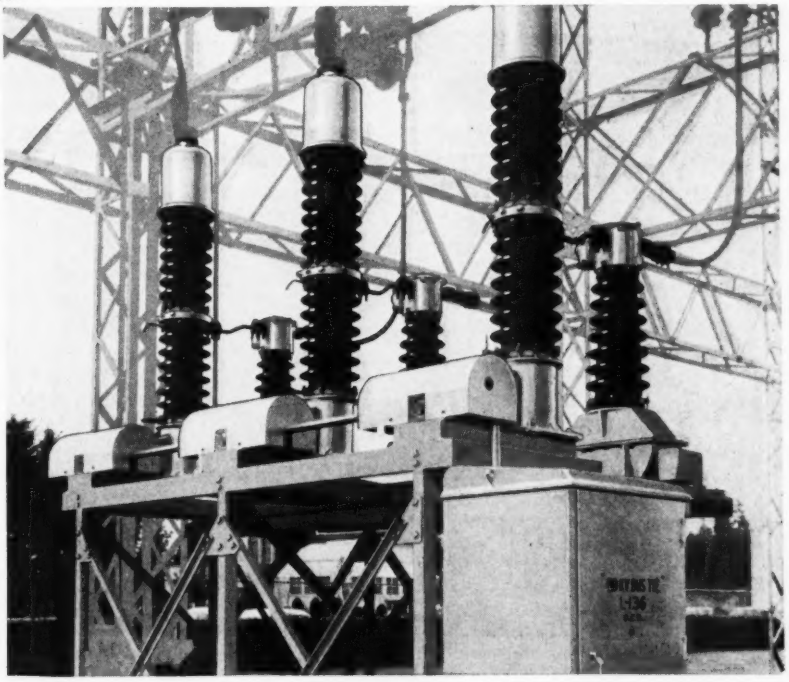
installation

A type TOFP 69 KV Power Circuit Breaker in a new Columbia River Power Sub Station near Chehalis, Washington



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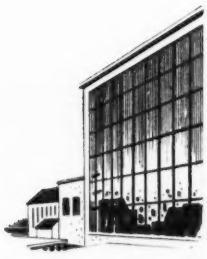

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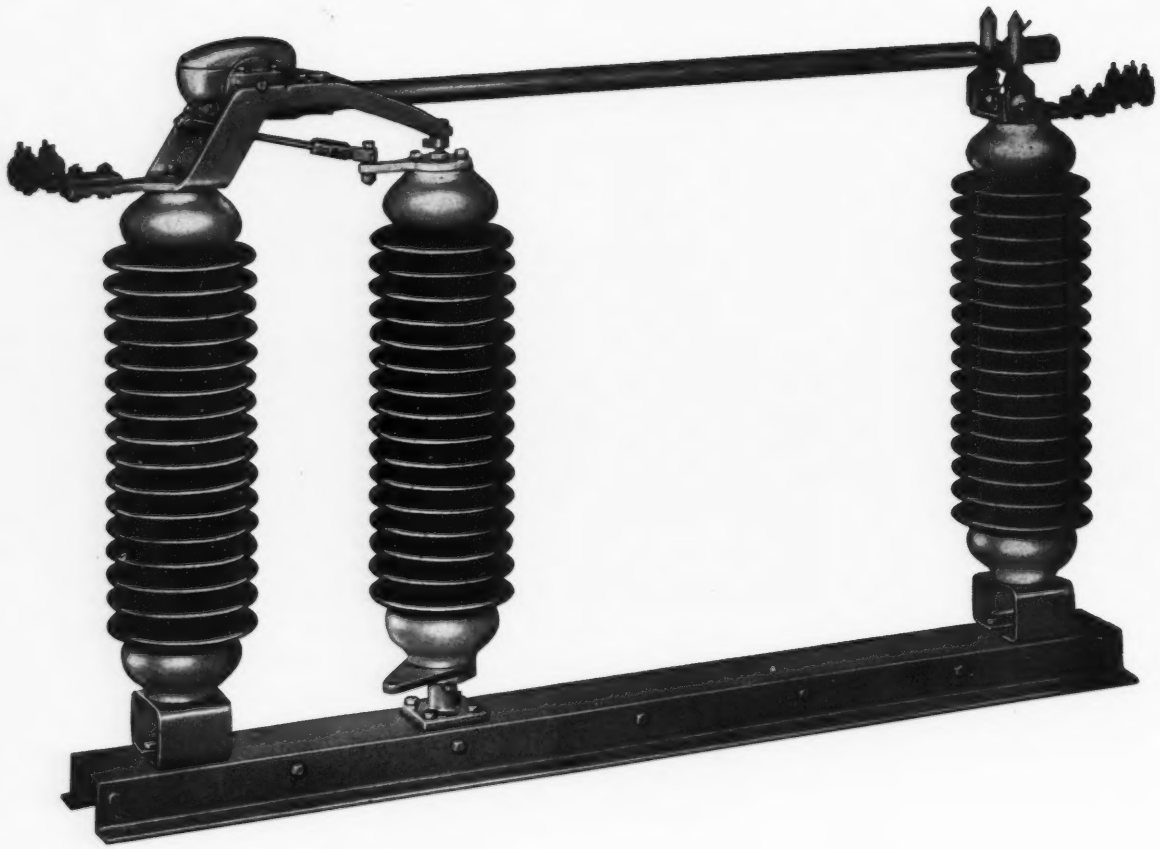

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See Bulletin 46-A

Look how a street lighting survey helped Chico, California

This intersection was dark and dangerous, with an average light intensity of only .20 footcandles.

The same intersection had an entirely different look, with an average light intensity of 1.60 footcandles when recommended changes were made.

"Our street lighting program has not only increased the safety of our citizens but also improved the appearance of the city," says The Honorable Ted Meriam, Mayor of Chico.

Chico, as well as many other Northern and Central California cities, has adopted a Master Plan to improve street lighting. Remember that adequate street lighting is more than paid for by the saving of lives and property, and that long range planning allows your city to spread the cost of this improvement over a period of years.

For long range street light planning, contact your local P. G. and E. office.

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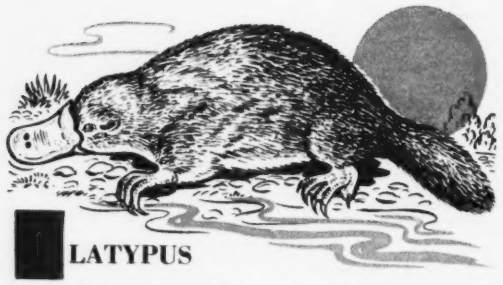
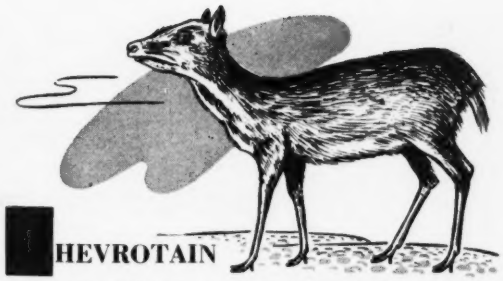


LATYPUS

An amphibious, duck-billed, web-footed, egg-laying Australian mammal with poison spurs on its hind feet.

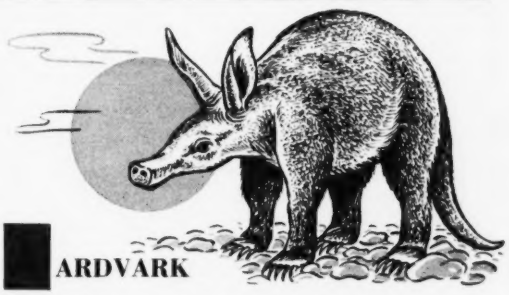


HEVROTAIN

A tiny rat-sized deer found in Asia and Africa having four toes on each foot, sharp canine tusks, no horns.

CHIDNA

Another primitive Australian mammal that lays eggs and nurses its young; also called the porcupine anteater.



ARDVARK

A large African burrowing mammal, feeding entirely on ants, which it catches with a long whip-like tongue.

. . . these uncommon animals by any other names would still be uncommon!

P.C.E.A. is an uncommon sort of an "animal," too. A lot of associations seem to spend most of their time talking to themselves. Not P.C.E.A.! We've spent our 36 years of active life constantly working to improve the industry's service to our customers — and we're proud of our accomplishments. From turbines to taxes, from Uniform Electrical Code to Adequate Wiring Programs, from home economics to handbooks, our activities have helped the electric industry to grow faster, provide more jobs, sell more electricity and make life safer and more pleasant.

If you aren't a member of this uncommon organization, we invite you to join today! If you are, we invite you to take a more active part. Contact either of our offices for full information.

Pacific Coast Electrical Association

530 W. Sixth Street, Los Angeles 14, California
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